FIG. 1

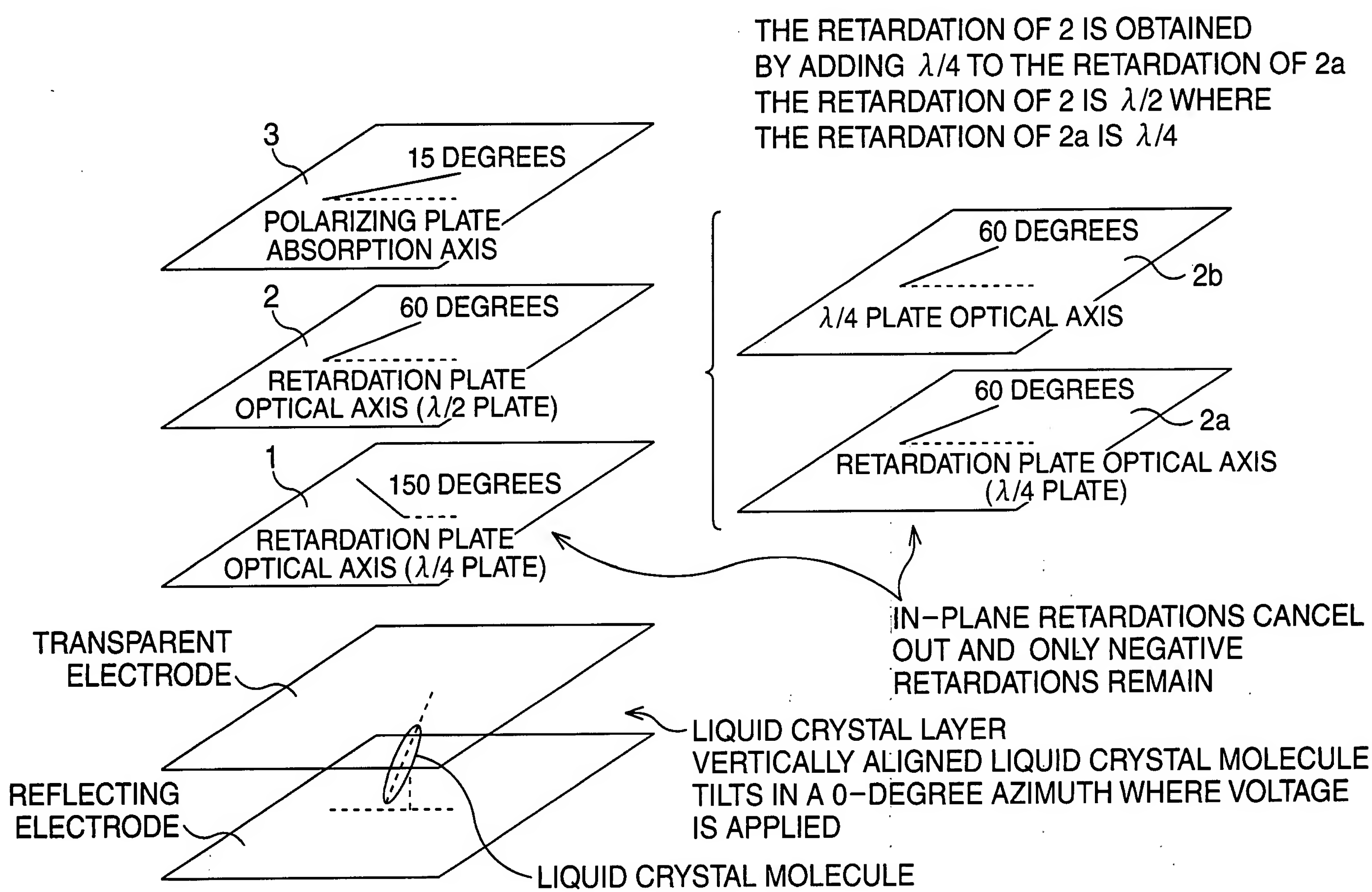
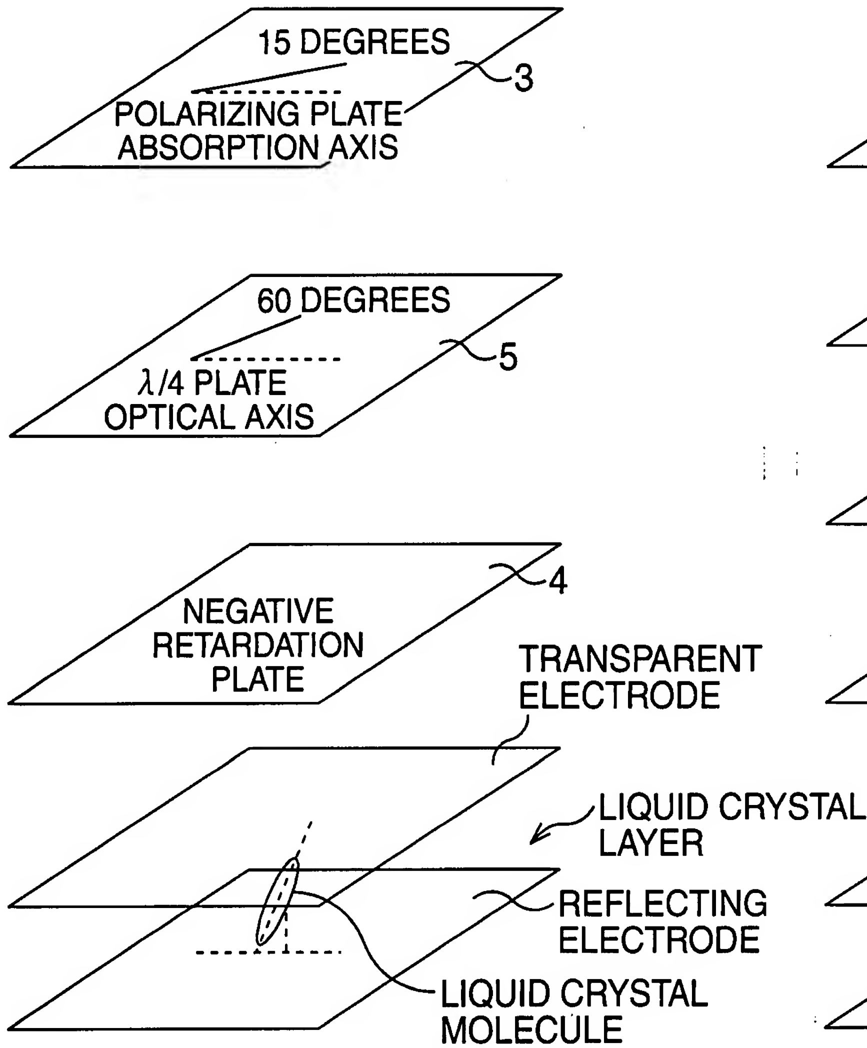
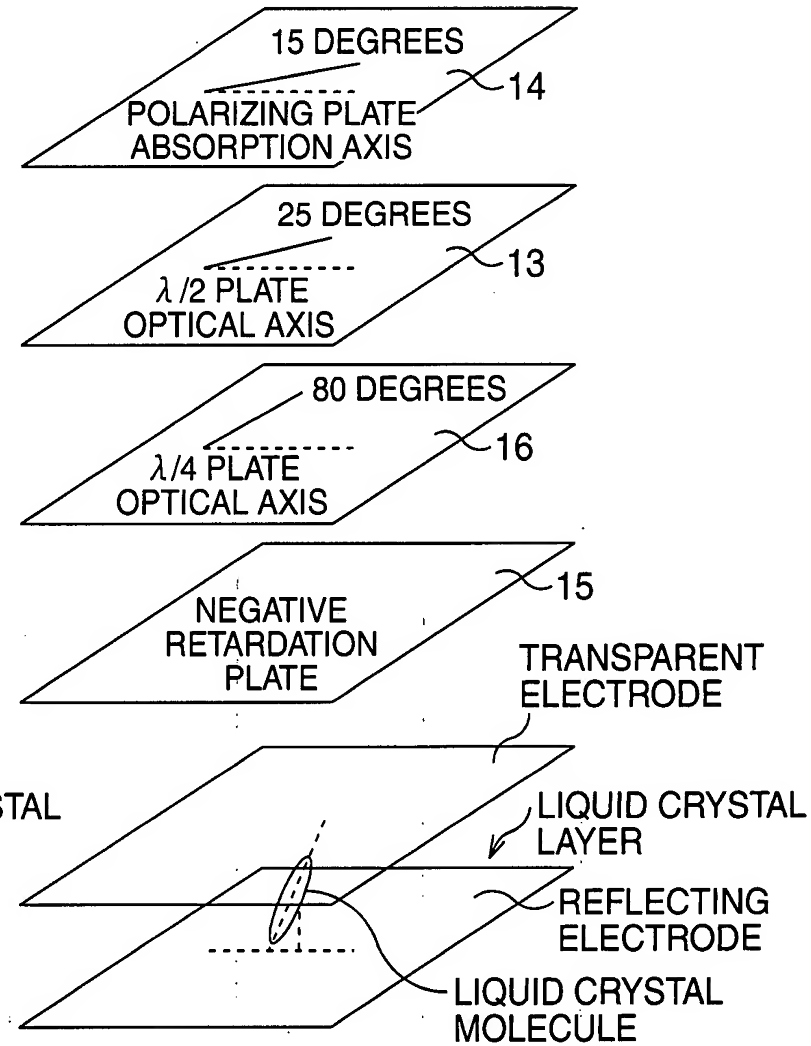

THE RETARDATION OF 2 IS OBTAINED
BY ADDING λ/4 TO THE RETARDATION OF 2a
THE RETARDATION OF 2 IS λ/2 WHERE
THE RETARDATION OF 2a IS λ/4
3
15 DEGREES
POLARIZING PLATE
ABSORPTION AXIS
2
60 DEGREES
RETARDATION PLATE
OPTICAL AXIS (λ/2 PLATE)
1
150 DEGREES
RETARDATION PLATE
OPTICAL AXIS (λ/4 PLATE)
60 DEGREES
2b
λ/4 PLATE OPTICAL AXIS
60 DEGREES
2a
RETARDATION PLATE OPTICAL AXIS
(λ/4 PLATE)
IN-PLANE RETARDATIONS CANCEL
OUT AND ONLY NEGATIVE
RETARDATIONS REMAIN
TRANSPARENT
ELECTRODE
REFLECTING
ELECTRODE
LIQUID CRYSTAL LAYER
VERTICALLY ALIGNED LIQUID CRYSTAL MOLECULE
TILTS IN A 0-DEGREE AZIMUTH WHERE VOLTAGE
IS APPLIED
LIQUID CRYSTAL MOLECULE

FIG. 2A



VERTICALLY ALIGNED LIQUID CRYSTAL MOLECULE TILTS IN A 0-DEGREE AZIMUTH WHERE VOLTAGE IS APPLIED

FIG. 2B



VERTICALLY ALIGNED LIQUID CRYSTAL MOLECULE TILTS IN A 0-DEGREE AZIMUTH WHERE VOLTAGE IS APPLIED

FIG. 3

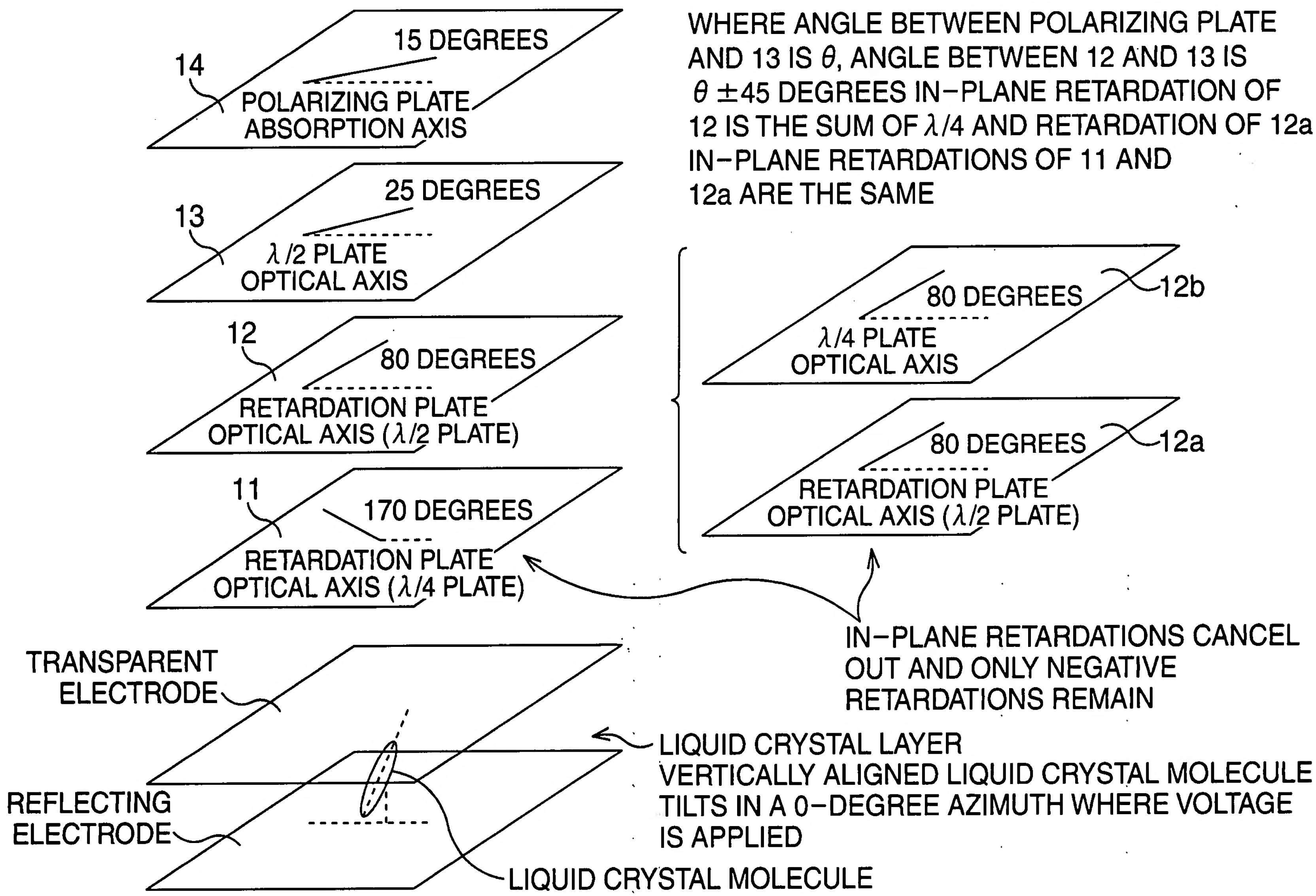

15 DEGREES
14
POLARIZING PLATE
ABSORPTION AXIS
25 DEGREES
13
λ/2 PLATE
OPTICAL AXIS
12
80 DEGREES
RETARDATION PLATE
OPTICAL AXIS (λ/2 PLATE)
11
170 DEGREES
RETARDATION PLATE
OPTICAL AXIS (λ/4 PLATE)
WHERE ANGLE BETWEEN POLARIZING PLATE AND 13 IS θ, ANGLE BETWEEN 12 AND 13 IS θ ±45 DEGREES IN−PLANE RETARDATION OF 12 IS THE SUM OF λ/4 AND RETARDATION OF 12a IN−PLANE RETARDATIONS OF 11 AND 12a ARE THE SAME
80 DEGREES
12b
λ/4 PLATE
OPTICAL AXIS
80 DEGREES
12a
RETARDATION PLATE
OPTICAL AXIS (λ/2 PLATE)
IN−PLANE RETARDATIONS CANCEL OUT AND ONLY NEGATIVE RETARDATIONS REMAIN
TRANSPARENT ELECTRODE
REFLECTING ELECTRODE
LIQUID CRYSTAL LAYER
VERTICALLY ALIGNED LIQUID CRYSTAL MOLECULE TILTS IN A 0−DEGREE AZIMUTH WHERE VOLTAGE IS APPLIED
LIQUID CRYSTAL MOLECULE

FIG. 4

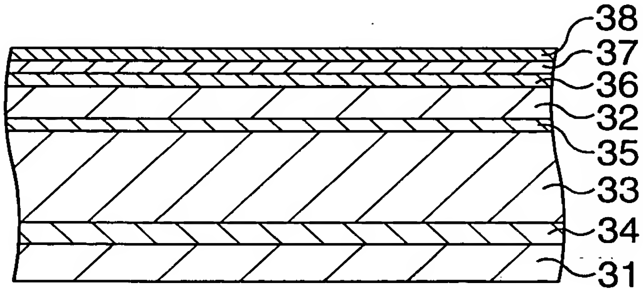


FIG. 5

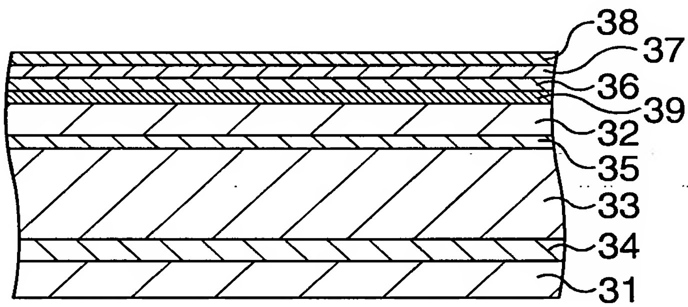


FIG. 6

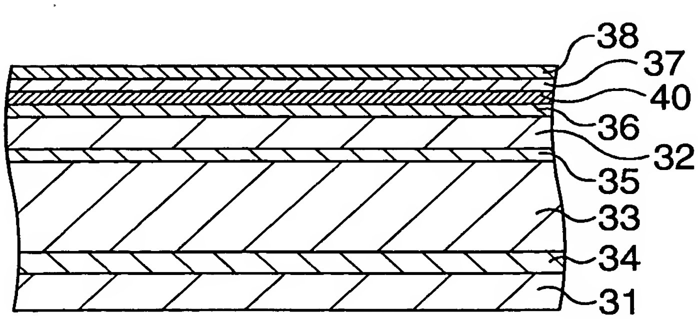


FIG. 7

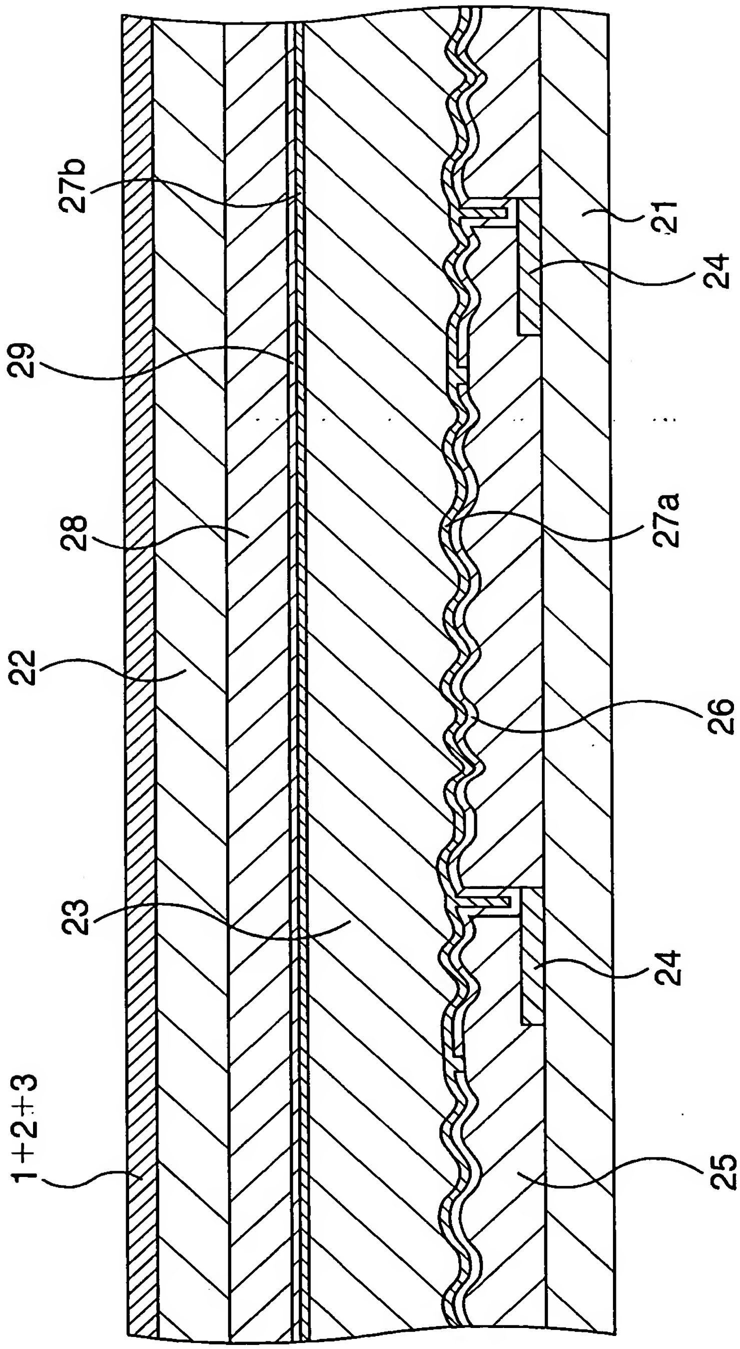


FIG. 8A

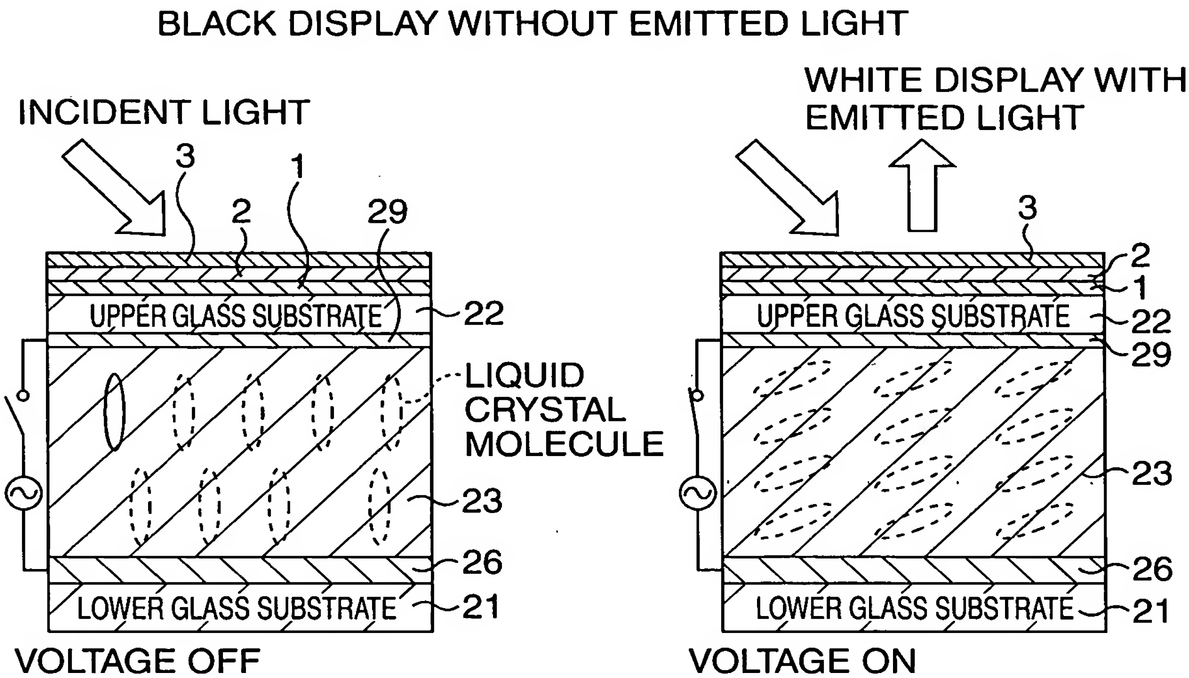

BLACK DISPLAY WITHOUT EMITTED LIGHT
INCIDENT LIGHT
3
2
1
29
UPPER GLASS SUBSTRATE
22
LIQUID CRYSTAL MOLECULE
23
26
LOWER GLASS SUBSTRATE
21
VOLTAGE OFF
WHITE DISPLAY WITH EMITTED LIGHT
VOLTAGE ON

FIG. 8B

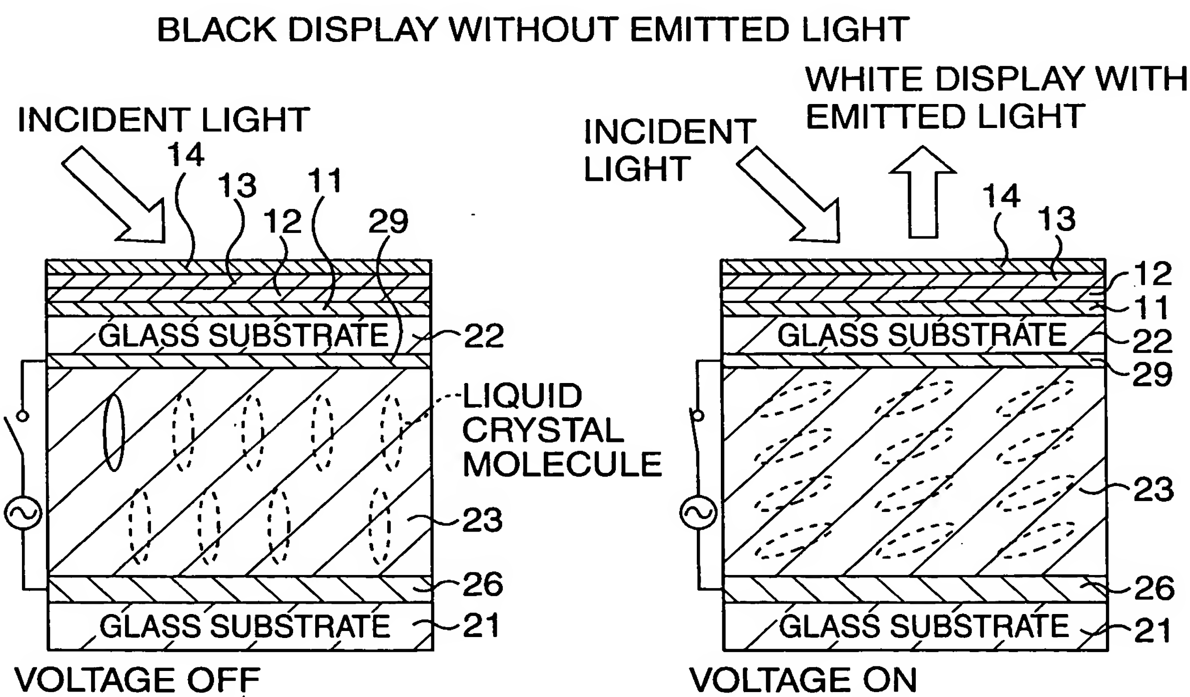

BLACK DISPLAY WITHOUT EMITTED LIGHT
INCIDENT LIGHT
14
13
11
12
29
GLASS SUBSTRATE
22
LIQUID CRYSTAL MOLECULE
23
26
GLASS SUBSTRATE
21
VOLTAGE OFF
WHITE DISPLAY WITH EMITTED LIGHT
INCIDENT LIGHT
VOLTAGE ON

FIG. 9

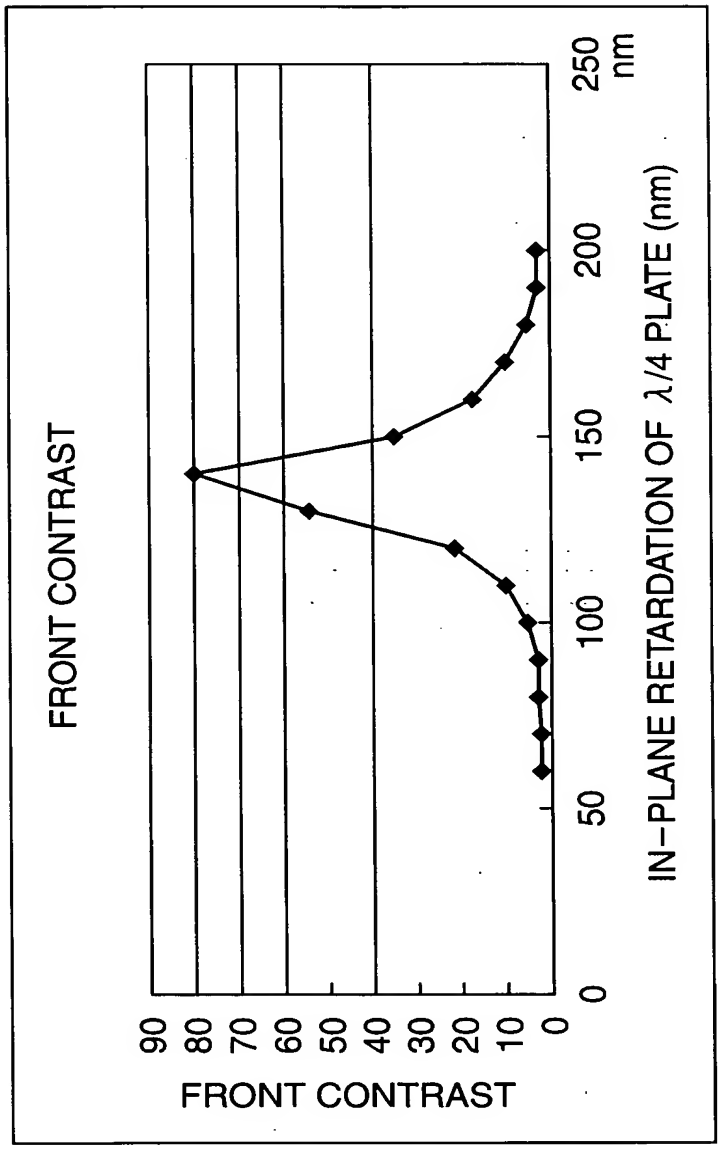
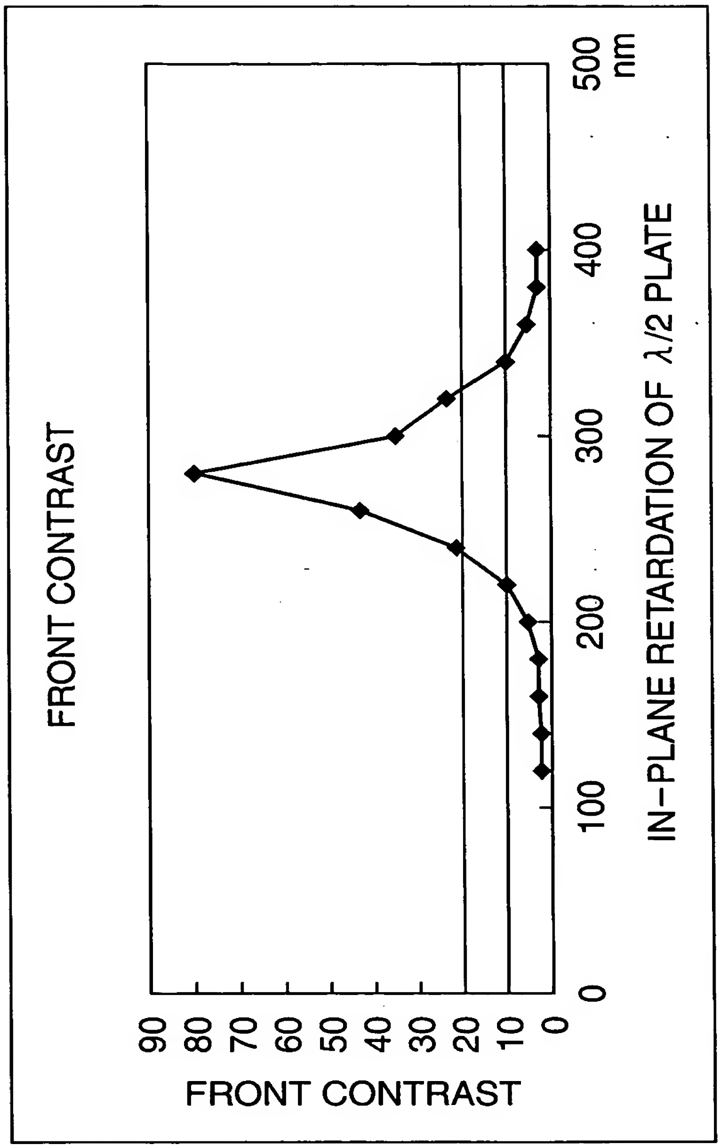

FRONT CONTRAST
90
80
70
60
50
40
30
20
10
0
FRONT CONTRAST
0
50
100
150
200
250
nm
IN-PLANE RETARDATION OF λ/4 PLATE (nm)

FIG. 10


FRONT CONTRAST
FRONT CONTRAST
90 80 70 60 50 40 30 20 10 0
0 100 200 300 400 500 nm
IN-PLANE RETARDATION OF λ/2 PLATE

LIQUID CRYSTAL DISPLAY... 5/21/04
Kunihiro Tashiro - Atty. Docket No. 1117.68737
Greer, Burns & Crain, Ltd. (Patrick G. Burns)
 (312) 360-0080

FIG. 11

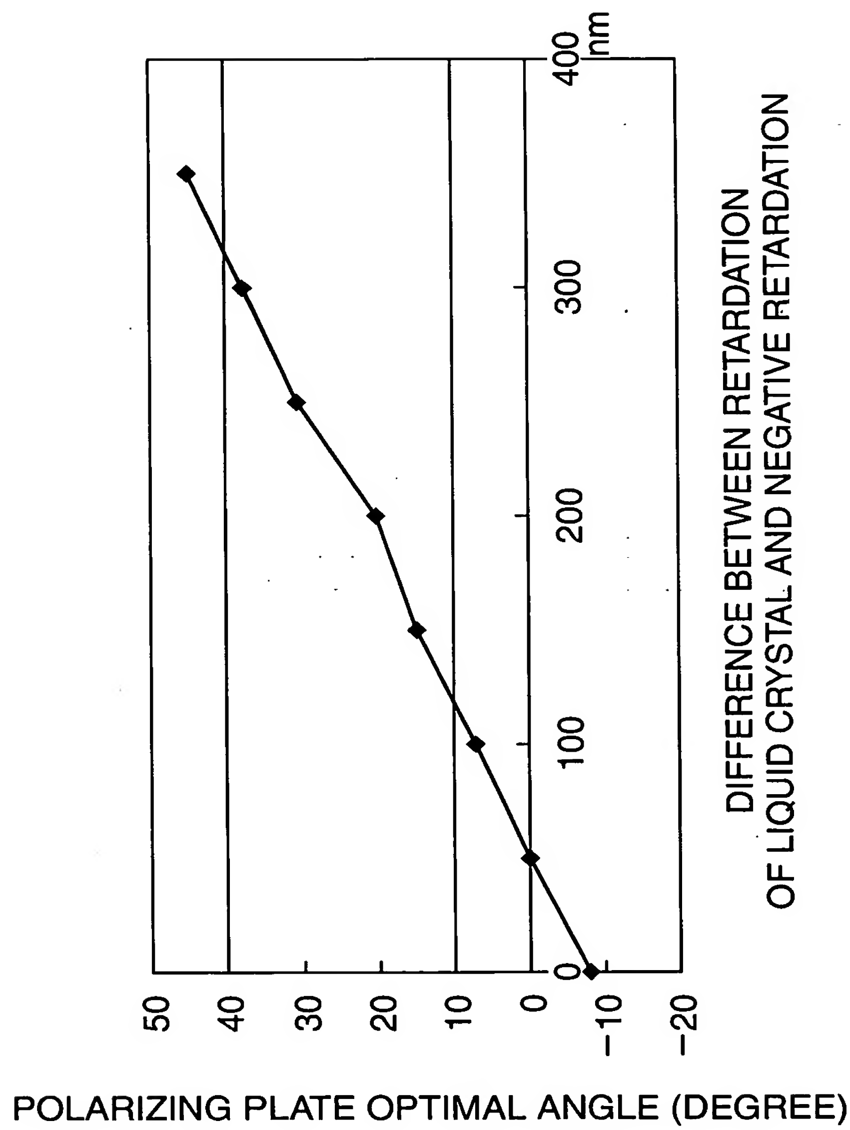
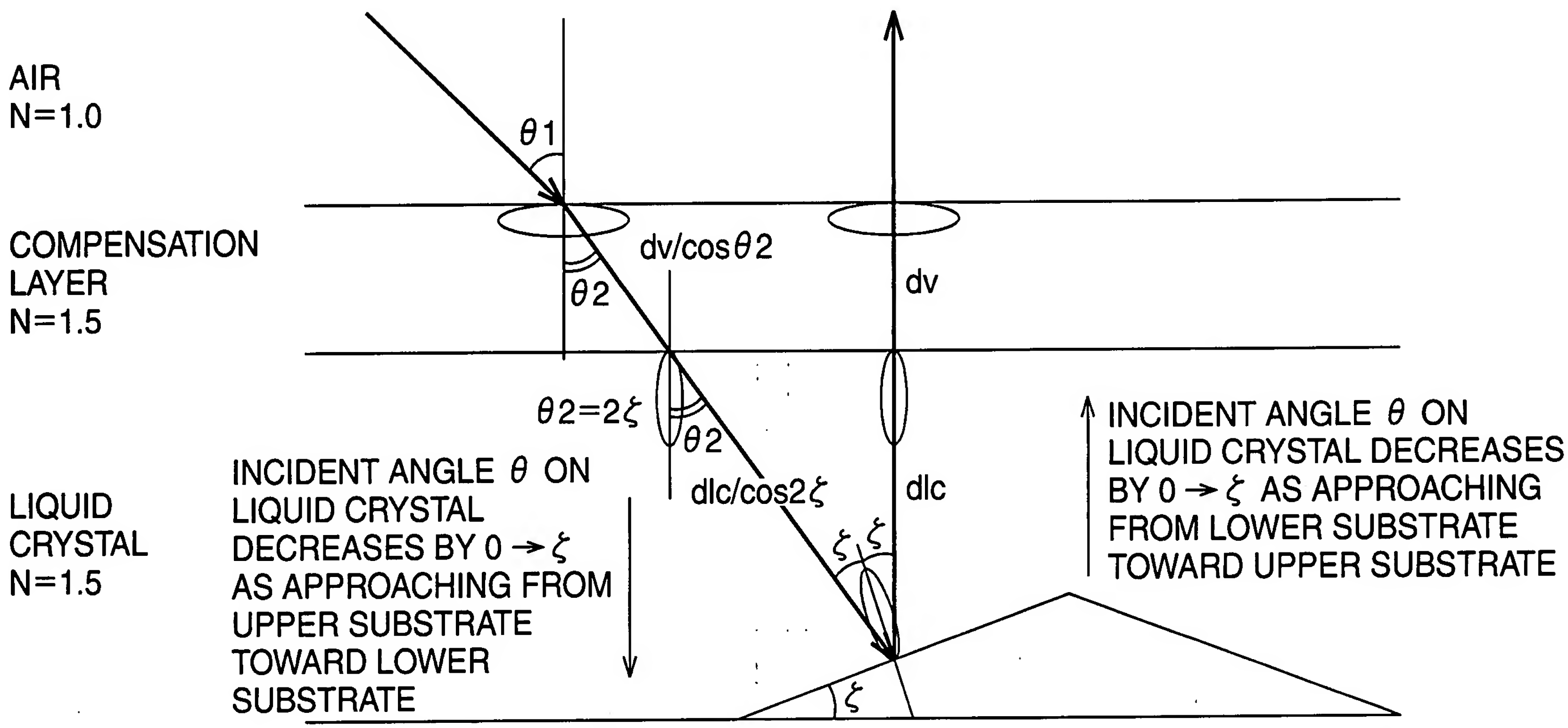


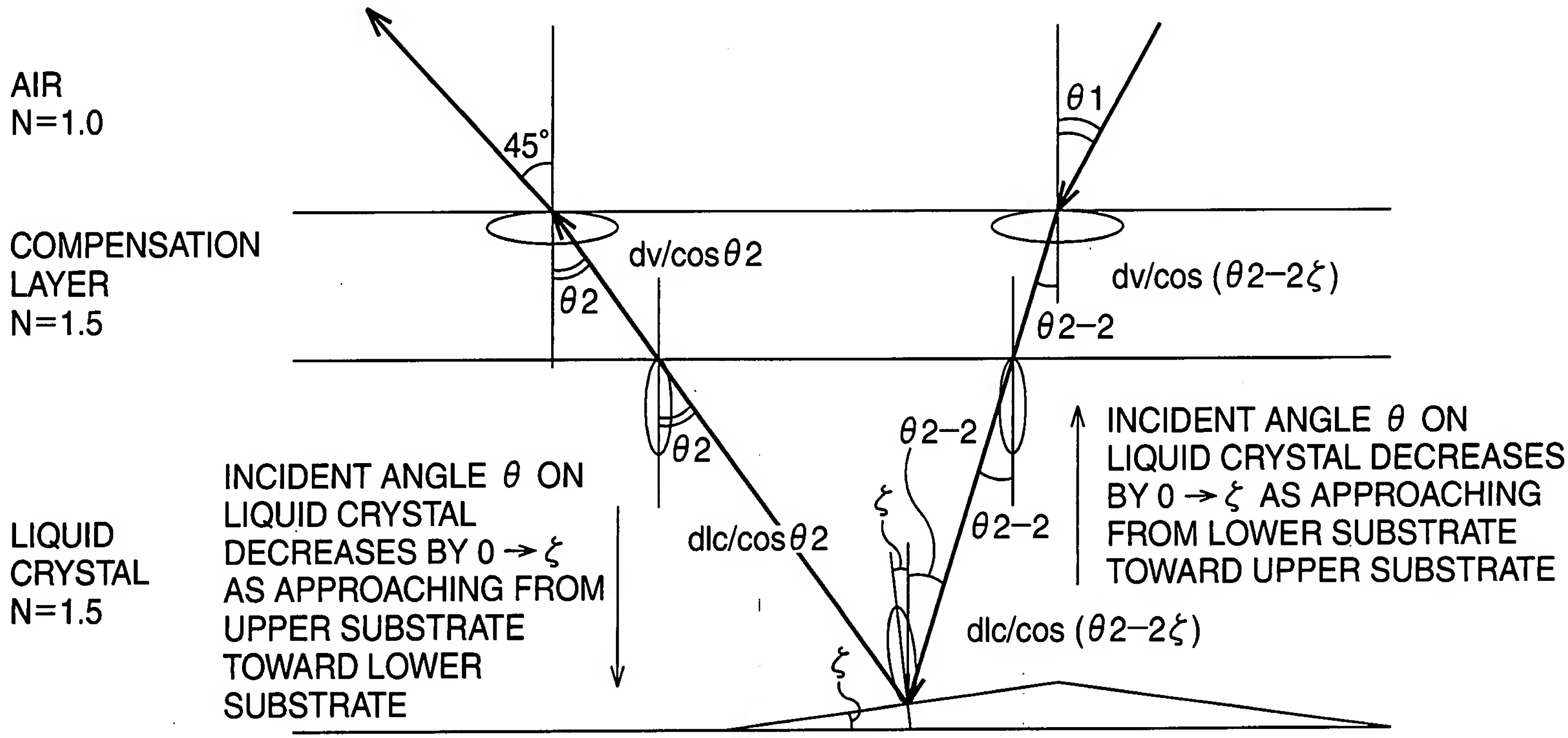
FIG. 12



		OPTICAL PATH LENGTH			OPTICAL PATH LENGTH
APPROACH ROUTE	VAC↓	$dv/\cos\theta 2 = dv/\cos 2\zeta$	RETURN ROUTE	VAC↑	dv
	LC↓	$dlc/\cos 2\zeta$		LC↑	dlc

METHOD FOR ESTIMATING RETARDATION OF LIQUID CRYSTAL LAYER WHERE NO VOLTAGE IS APPLIED AND RETARDATION OF RETARDATION PLATE (OBSERVATION ANGLE OF 0°)

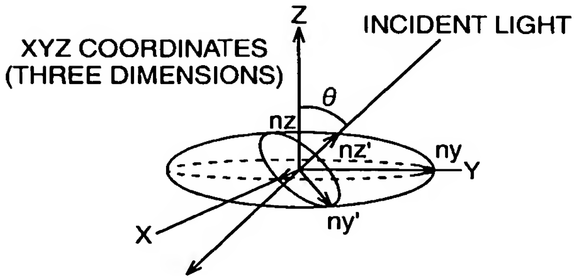
FIG. 13



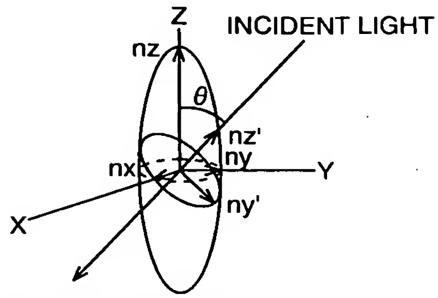
		OPTICAL PATH LENGTH			OPTICAL PATH LENGTH
RETURN ROUTE	VAC↑	dv/cosθ2	APPROACH ROUTE	VAC↓	dv/cos (θ2−2ζ)
	LC↑	dlc/cosθ2		LC↓	dlc/cos (θ2−2ζ)

METHOD FOR ESTIMATING RETARDATION OF LIQUID CRYSTAL LAYER WHERE NO VOLTAGE IS APPLIED AND RETARDATION OF RETARDATION PLATE (OBSERVATION ANGLE OF 45°)

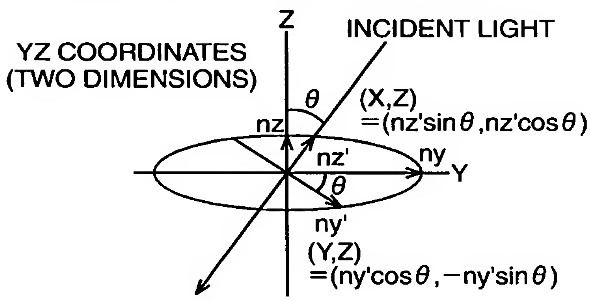
FIG. 14

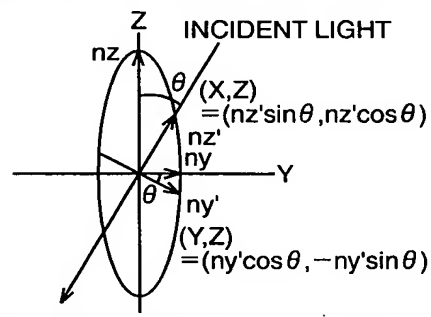


ASSUME THAT RETARDATION PLATE IS INDEX ELLIPSOID HAVING NEGATIVE REFRACTIVE INDEX ANISOTROPY IN SUBSTRATE VERTICAL DIRECTION



ASSUME THAT LIQUID CRYSTAL IS INDEX ELLIPSOID HAVING POSITIVE REFRACTIVE INDEX ANISOTROPY IN SUBSTRATE VERTICAL DIRECTION





THE APPARENT REFRACTIVE INDEXES nx', ny', nz' WHEN LIGHT IS INCIDENT, AT AN INCIDENT ANGLE OF θ, ON XY PLANE CORRESPOND TO THE CUT SURFACE OF AN ELLIPSOID ROTATED $-\theta$ FROM THE X-AXIS, AND nx=nx, ny', nz' CAN BE FOUND BY THE FOLLOWING EQUATIONS

$$\frac{Y^2}{Ny^2}+\frac{Z^2}{Nz^2}=1$$

$$\frac{Ny'^2\cos^2\theta}{Ny^2}+\frac{Ny'^2\sin^2\theta}{Nz^2}=1$$

$$Ny^{2'}=\frac{1}{\frac{\cos^2\theta}{Ny^2}+\frac{\sin^2\theta}{Nz^2}}$$

$$Ny'=\frac{NyNz}{\sqrt{Nz^2\cos^2\theta+Ny^2\sin^2\theta}}=\frac{Nz}{\sqrt{\frac{Nz^2}{Ny^2}\cos^2\theta+(1-\cos^2\theta)}}=\frac{Nz}{\sqrt{1-\nu\cos^2\theta}}$$

HOWEVER, $\nu=\frac{Ny^2-Nz^2}{Ny^2}$

WHEN Nz' IS SIMILARLY FOUND

$$\frac{Y^2}{Ny^2}+\frac{Z^2}{Nz^2}=1$$

$$\frac{Ny'^2\sin^2\theta}{Ny^2}+\frac{Ny'^2\cos^2\theta}{Nz^2}=1$$

$$Ny^{2'}=\frac{1}{\frac{\sin^2\theta}{Ny^2}+\frac{\cos^2\theta}{Nz^2}}$$

$$Ny'=\frac{NyNz}{\sqrt{Nz^2\sin^2\theta+Ny^2\cos^2\theta}}=\frac{Nz}{\sqrt{\frac{Nz^2}{Ny^2}(1-\cos^2\theta)+\cos^2\theta}}=\frac{Nz}{\sqrt{\frac{Nz^2}{Ny^2}+\nu\cos^2\theta}}$$

METHOD FOR FINDING REFRACTIVE INDEX ANISOTROPY WHEN LIGHT IS INCIDENT, TILTING θ FROM Z-AXIS, ON LIQUID CRYSTAL AND RETARDATION PLATE

FIG. 15

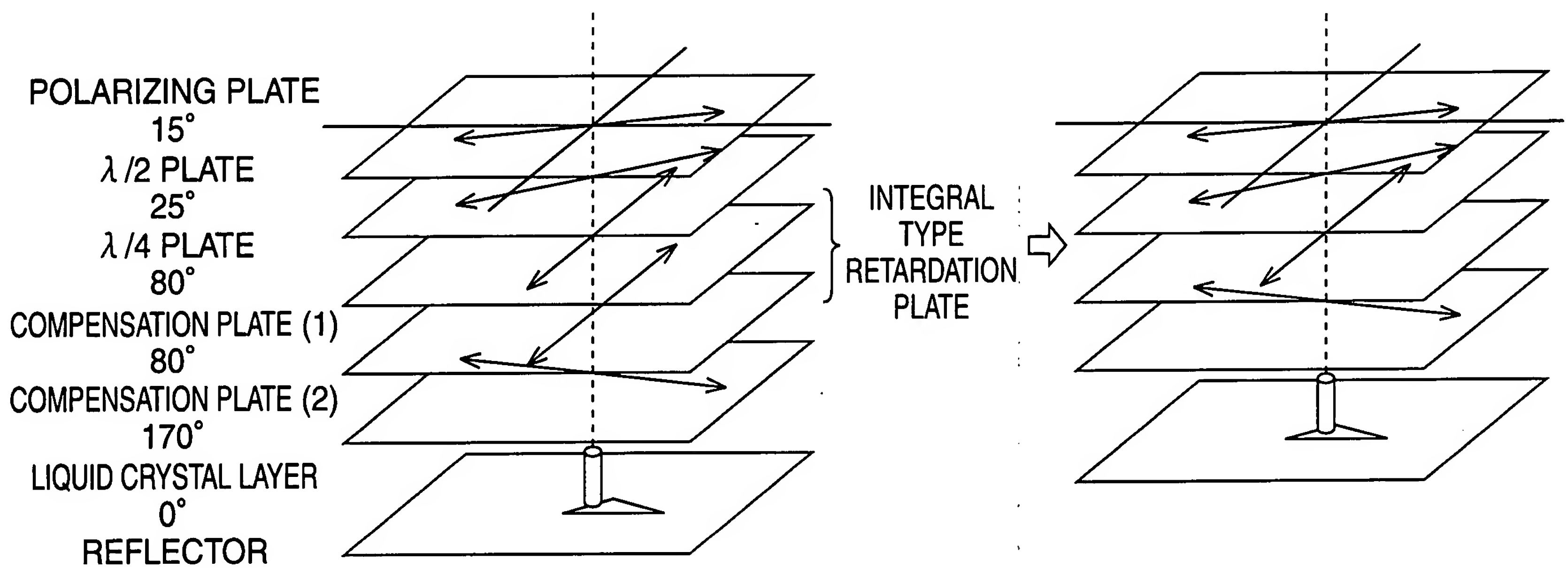
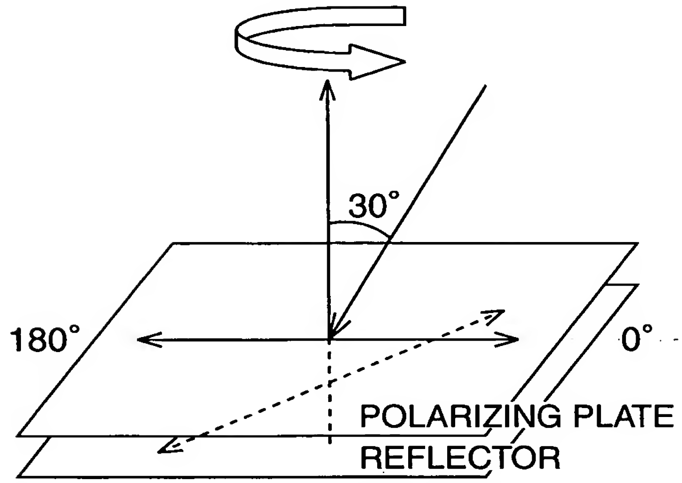

POLARIZING PLATE
15°
λ /2 PLATE
25°
λ /4 PLATE
80°
COMPENSATION PLATE (1)
80°
COMPENSATION PLATE (2)
170°
LIQUID CRYSTAL LAYER
0°
REFLECTOR
INTEGRAL
TYPE
RETARDATION
PLATE

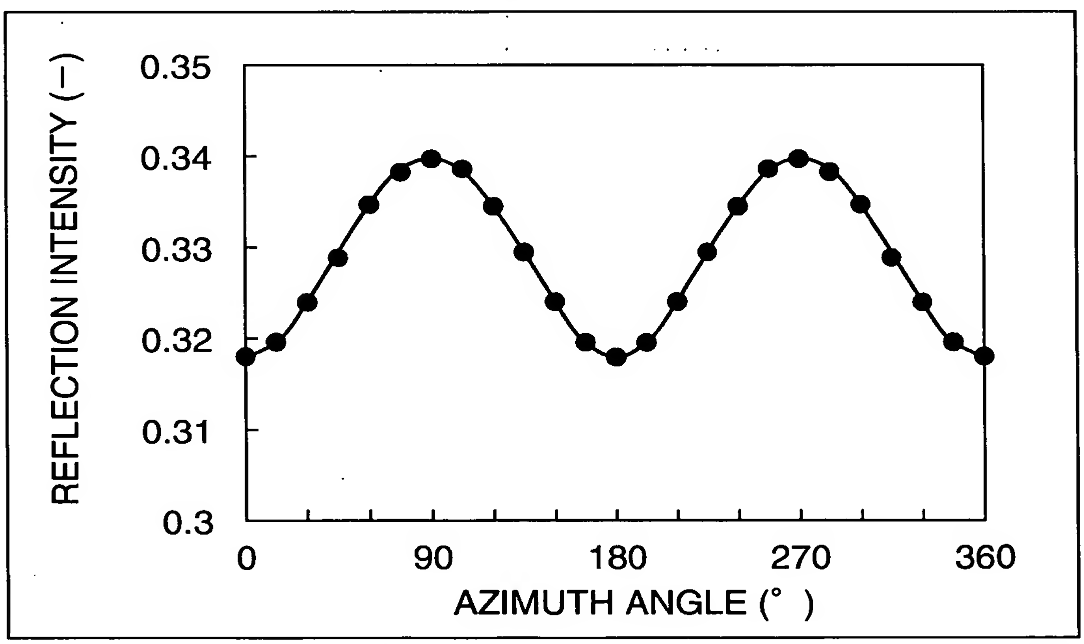
FIG. 16



CONFIGURATION OF SINGLE POLARIZING PLATE AND MEASUREMENT METHOD

THE POLARIZING PLATE WAS ARRANGED SUCH THAT ITS ABSORPTION AXIS WAS IN A 0° AZIMUTH, AND THE REFLECTION INTENSITY WAS MEASURED WITH THE AZIMUTH ANGLE OF A 30°.

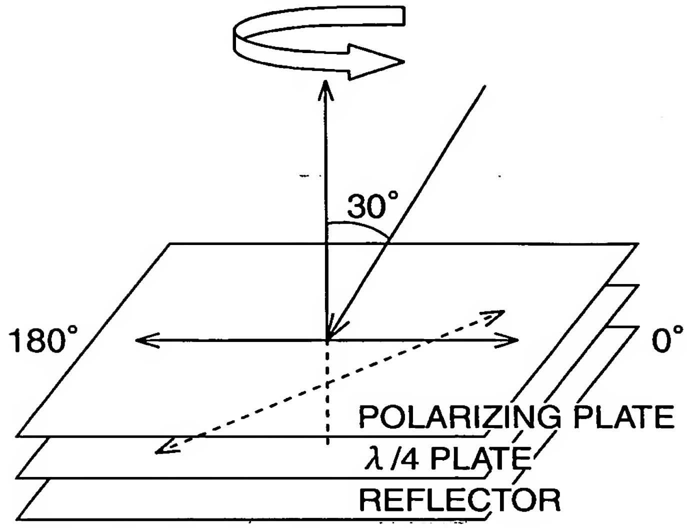
FIG. 17



AZIMUTH ANGLE CHARACTERISTICS OF SINGLE POLARIZING PLATE (30° INCIDENCE)

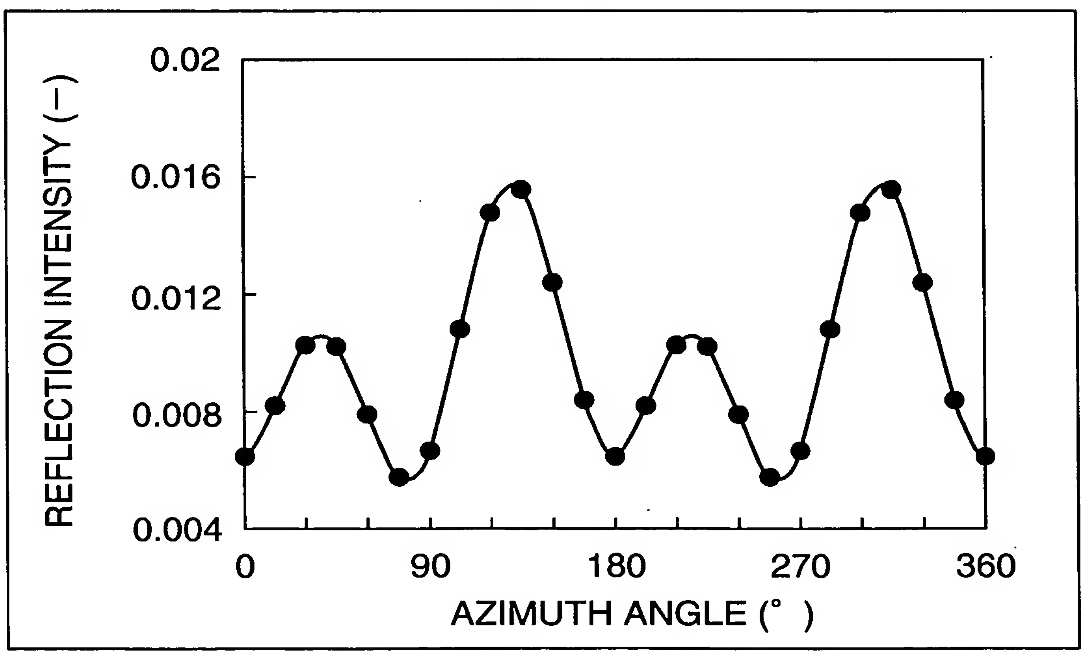
THE REFLECTION INTENSITY IS MINIMUM INTHE ABSORPTION AXIS AZIMUTH (0°,180°), AND THE REFLECTION IS MAXIMUM IN THE TRANSMISSION AXIS AZIMUTH (90° ,270°).

FIG. 18



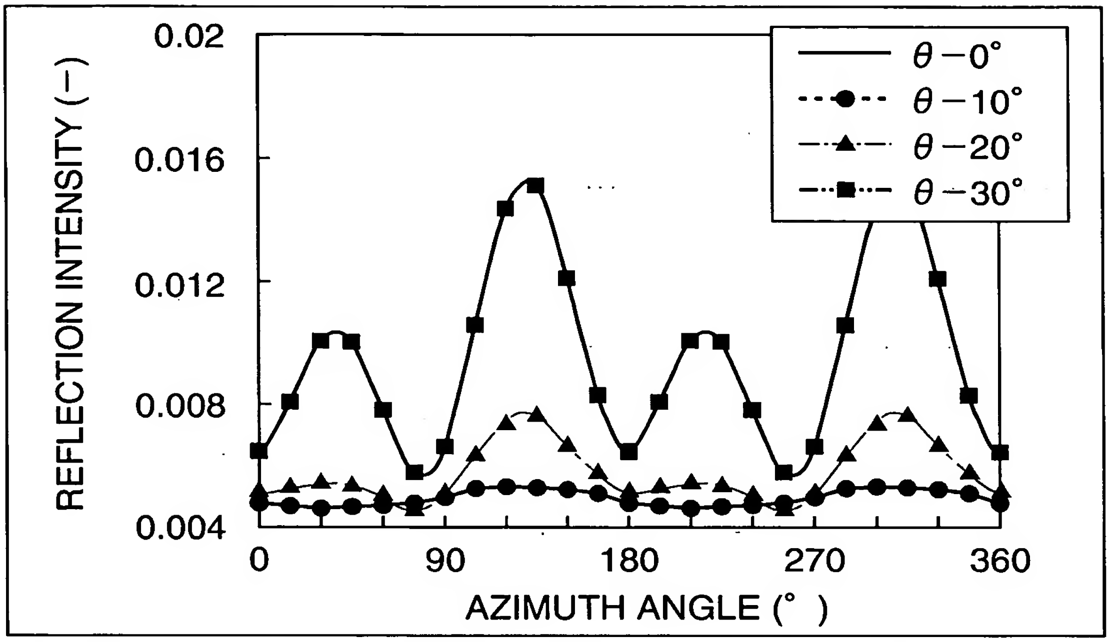
CONFIGURATION OF POLARIZING PLATE + λ/4 AND MEASUREMENT METHOD
THE λ/4 PLATE WAS ARRANGED SUCH THAT THE ANGLE FORMED BETWEEN ITS SLOW AXIS AND ABSORPTION AXIS WAS 45°, AND THE REFLECTION INTENSITY WAS MEASURED WITH THE AZIMUTH ANGLE OF A 30°.

FIG. 19



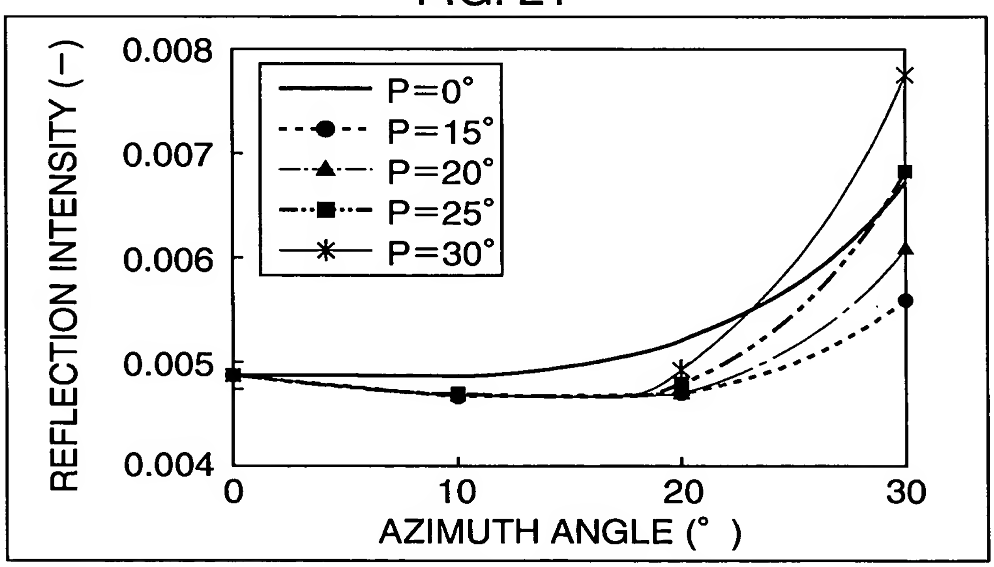
POLARIZING PLATE + λ/4 AZIMUTH ANGLE CHARACTERISTICS (1) (30° INCIDENCE)
WHEN THE SLOW AXIS OF THE RETARDATION PLATE IS AT 45°, THE REFLECTION INTENSITY IS MINIMUM IN THE AZIMUTHS DEVIATED BY 45° −15° FROM THE SLOW AXIS.

FIG. 20



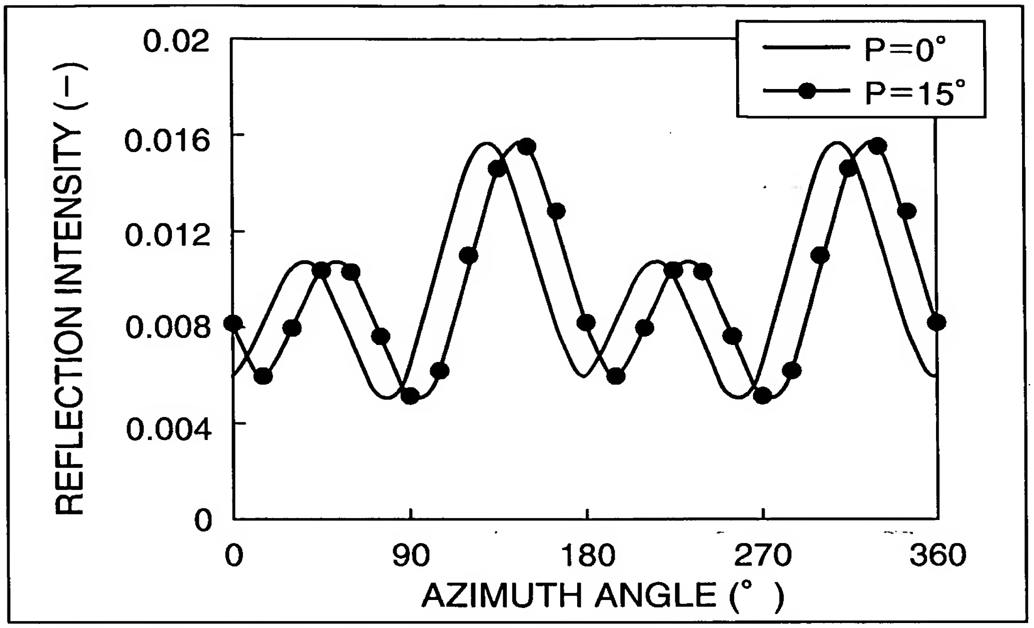
POLARIZING PLATE +λ/4 PLATE AZIMUTH ANGLE CHARACTERISTICS (2) (0−30° INCIDENCE)
WITH AN INCREASE IN INCIDENT ANGLE, THE AZIMUTH IN WHICH THE REFLECTION INTENSITY IS MINIMUM INCREASINGLY DEVIATES TO A MINUS AZIMUTH.

FIG. 21



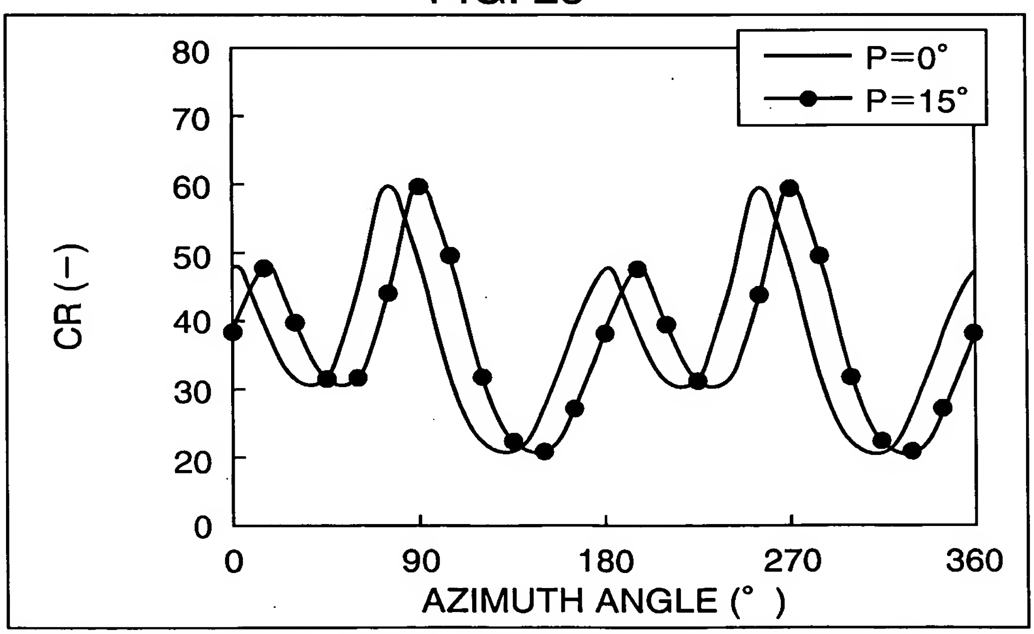
POLAEIZING PLATE +λ/4 PLATE INCIDENT ANGLE CHARACTERISTICS (1) (270° AZIMUTH)
WHEN THE AXIS PLACEMENT IS ROTATED +15° IN AN AZIMUTH OPPOSITE TO THE DEVIATION, THE REFLECTION INTENSITY BECOMES MINIMUM WITHIN THE WHOLE INCIDENT ANGLE RANGE. THE CONTRAST RATIO IS IMPROVED AS COMPARED WITH THAT BEFORE FOTATION WITHIN A RANGE OF 0° TO 25°.

FIG. 22



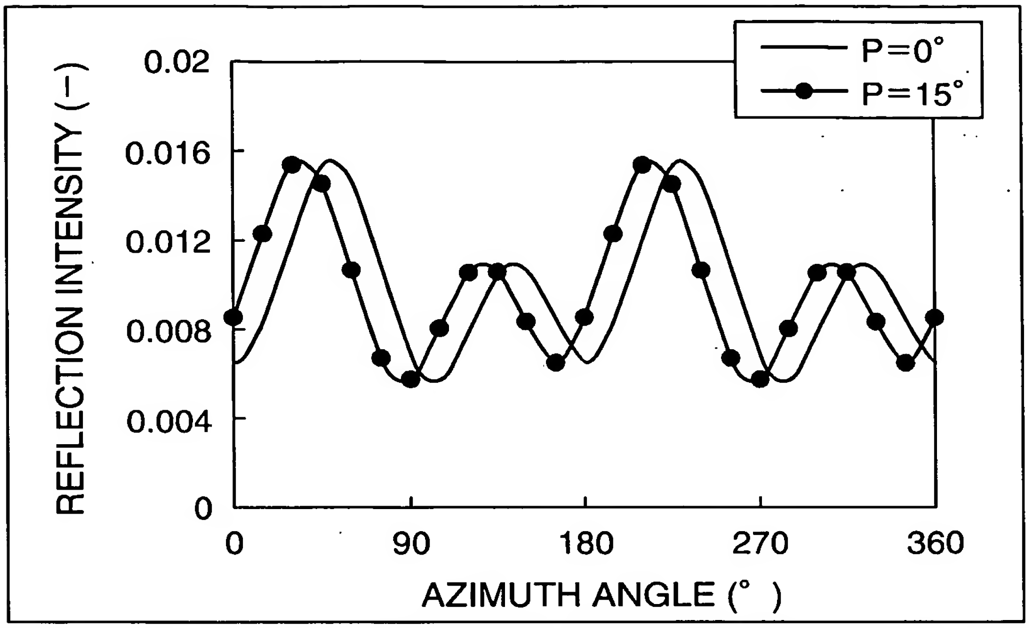
POLARIZING PLATE + λ/4 PLATE AZIMUTH ANGLE CHARACTERISTICS (3) (30° INCIDENCE)
WHEN THE AXIS PLACEMENT IS ROTATED +15° IN AN AZIMUTH OPPOSITE TO THE DEVIATION, THE REFLECTION INTENSITY BECOMES MINIMUM IN THE DIRECTIONAL AZIMUTH (90°, 270°).

FIG. 23



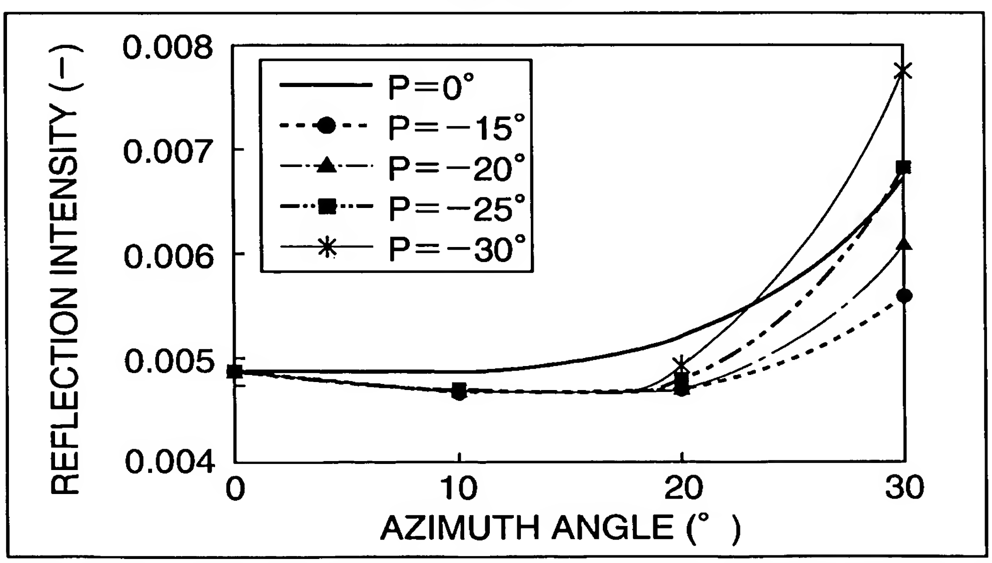
POLARIZING PLATE + λ/4 PLATE AZIMUTH ANGLE CHARACTERISTICS (4) (30° INCIDENCE)
WHEN THE AXIS PLACEMENT IS ROTATED +15° IN AN AZIMUTH OPPOSITE TO THE DEVIATION, CR BECOMES MAXIMUM IT THE DIRECTIONAL AZIMUTH (90° , 270°).

FIG. 24



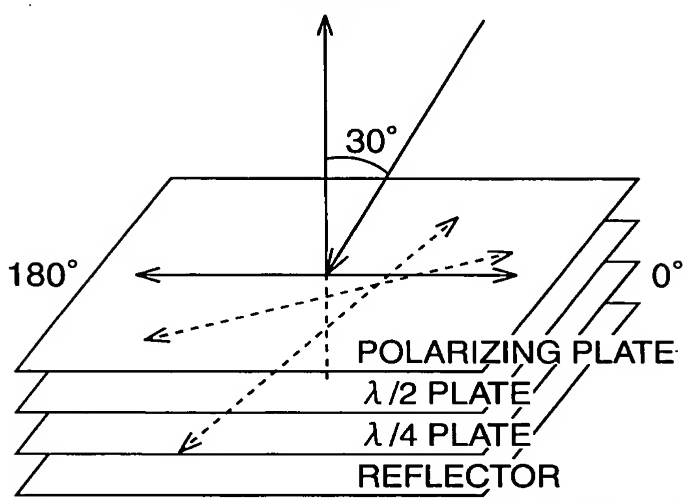
POLARIZING PLATE + $\lambda/4$ PLATE AZIMUTH ANGLE CHARACTERISTICS (5) (30° INCIDENCE)
WHEN THE SLOW AXIS OF THE RETARDATION PLATE IS AT 135°, THE AZIMUTH IN WHICH THE REFLECTION INTENSITY IS MINIMUM DEVIATES TO A PLUS AZIMUTH. HENCE, THE AXIS PLACEMENT IS ROTATED −15°, WHEREBY THE REFLECTION INTENSITY BECOMES MINIMUM IN THE DIRECTIONAL AZIMUTH.

FIG. 25



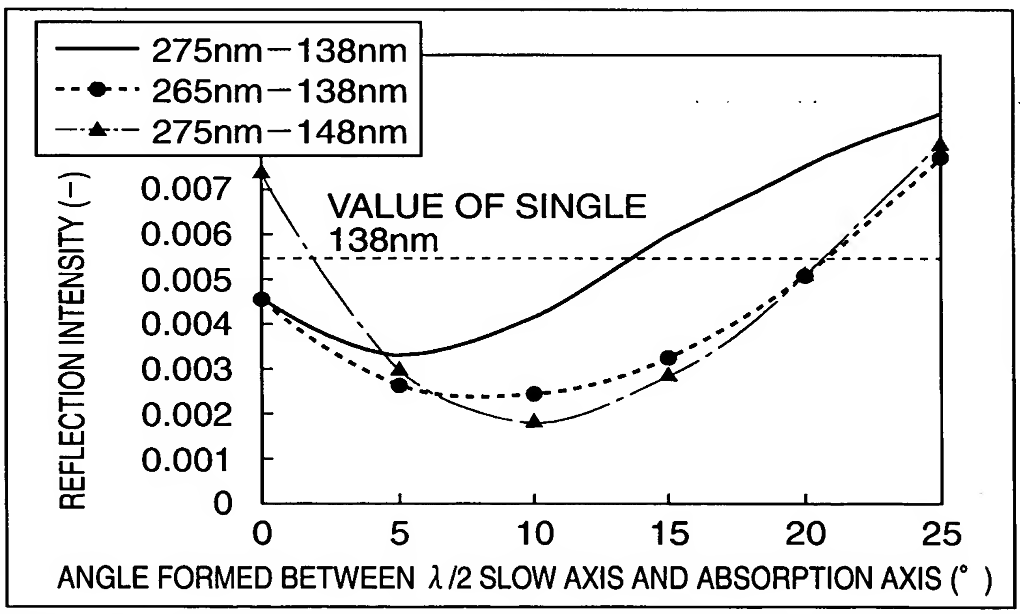
POLARIZING PLATE + $\lambda/4$ PLATE INCIDENT ANGLE CHARACTERISTICS (2) (270° AZIMUTH)
WHEN THE AXIS PLACEMENT IS ROTATED −15° IN AN AZIMUTH OPPOSITE TO THE DEVIATION, THE REFLECTION INTENSITY BECOMES MINIMUM WITHIN THE WHOLE INCIDENT ANGLE RANGE. THE CONTRAST RATIO IS IMPROVED AS COMPARED WITH THAT BEFORE ROTATION WITHIN A RANGE OF 0° TO −25°.

FIG. 26



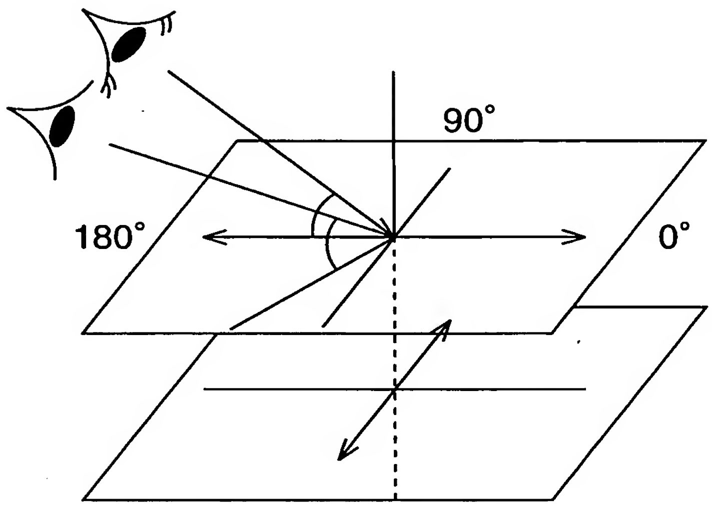
CONFIGURATION OF POLARIZING PLATE +BROADBAND λ/4 AND MEASUREMENT METHOD
THE λ/2 PLATE AND THE POLARIZING PLATE WERE ARRANGE SUCH THAT THE ANGLE FORMED BETWEEN RESPECTIVE SLOW AXIS AND ABSORPTION AXIS WAS 0 TO 25°, AND THE REFLECTION INTENSITY WAS MEASURED WITH RESPECT TO A 30° INCIDENCE.

FIG. 27



POLARIZING PLATE +BROADBAND λ/4 PLATE AXIAL CHARACTERISTICS (30° INCIDENCE, 270° AZIMUTH)
IN A 275nm−138nm COMBINATION, THE REFLECTION INTENSITY BECOMES MINIMUM IN THE DIRECTIONAL AZIMUTH BY SETTING THE ANGLE FORMED BETWEEN THE λ/2 SLOW AXIS AND THE POLARIZING PLATE ABSORPTION AXIS TO 5°.
ON THE OTHER HAND, IN 265nm−138nm, AND 275nm−148nm COMBINATIONS, THE REFLECTION INTENSITY BECOMES MINIMUM AT THE FORMED ANGLE OF 10° , AND THE OPTIMAL ANGLE DIFFERS DEPENDING ON THE COMBINATION OF RETARDATION PLATES IN USE. IN A RANGE OF AN ANGLE OF 0 TO 20°, THE CONTRAST RATIO IS IMPROVED AS COMPARES TO THAT OF THE SINGLE λ/4 PLATE.

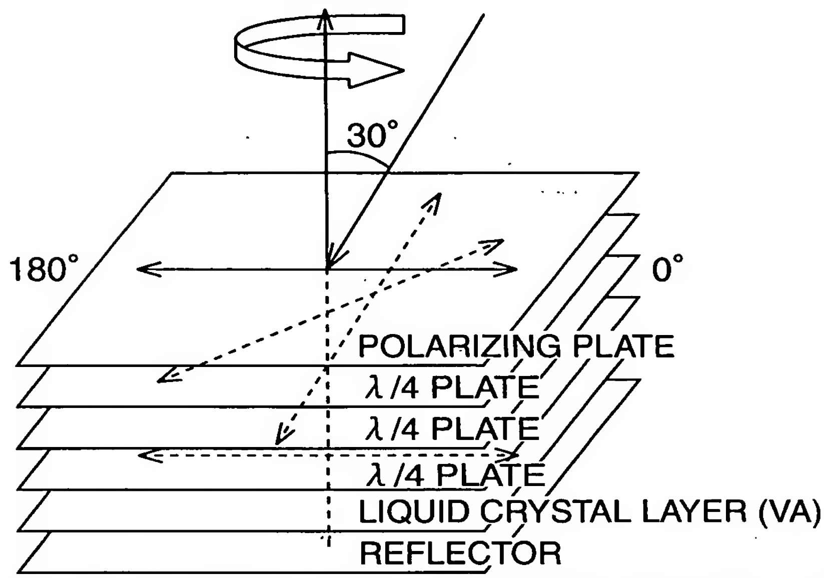
FIG. 28



AXIS PLACEMENT OF UNIAXIALLY
STRETCHED FILMS
(ORTHOGONAL PLACEMENT)

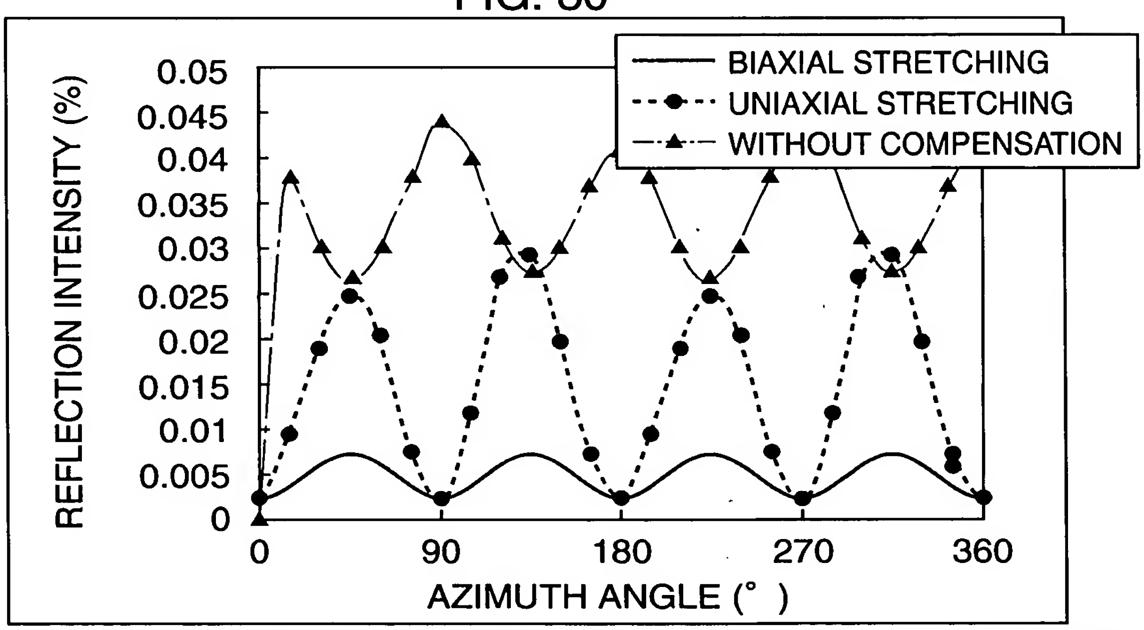
LIGHT LEAKAGE OCCURS IN
AZIMUTHS DIFFERENT FROM THOSE
OF THE SLOW AXES OF
THE UNIAXIALLY FILMS.

FIG. 29



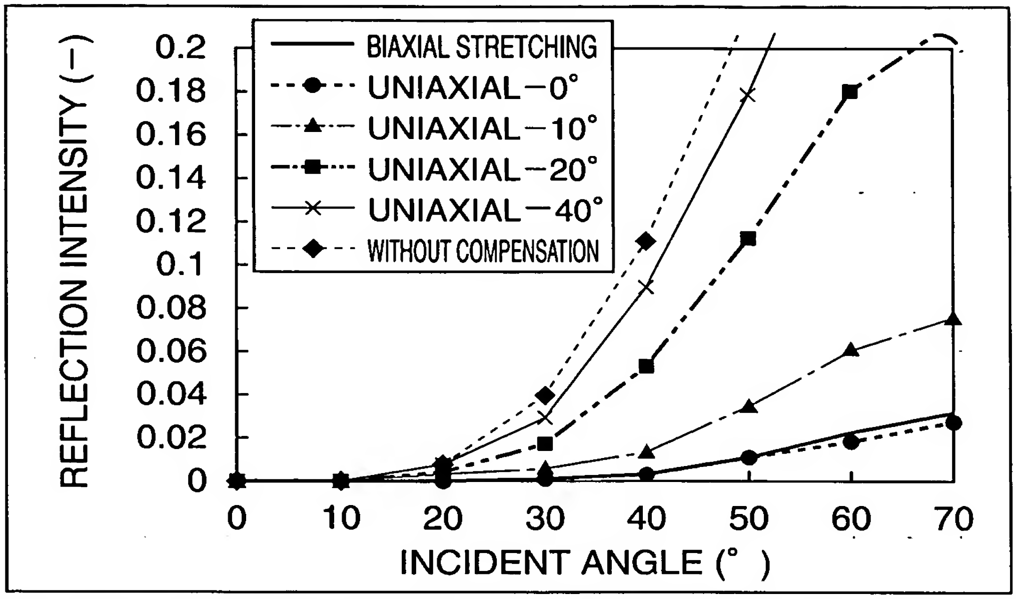
CONFIGURATION OF POLARIZING PLATE+ λ/4+COMPENSATION PLATE AND MEASUREMENT METHOD
ARRANGEMENT WAS MADE SUCH THAT THE ANGLE FORMED BETWEEN THE DIRECTIONAL AZIMUTH AND THE SLOW AXIS OF THE UNIAXIALLY STRETCHED FILM WAS 0 TO 40°, AND THE REFLECTION INTENSITY WAS MEASURED WITH THE AZIMUTH ANGLE OF A 30° INCIDENCE VARIED.

FIG. 30



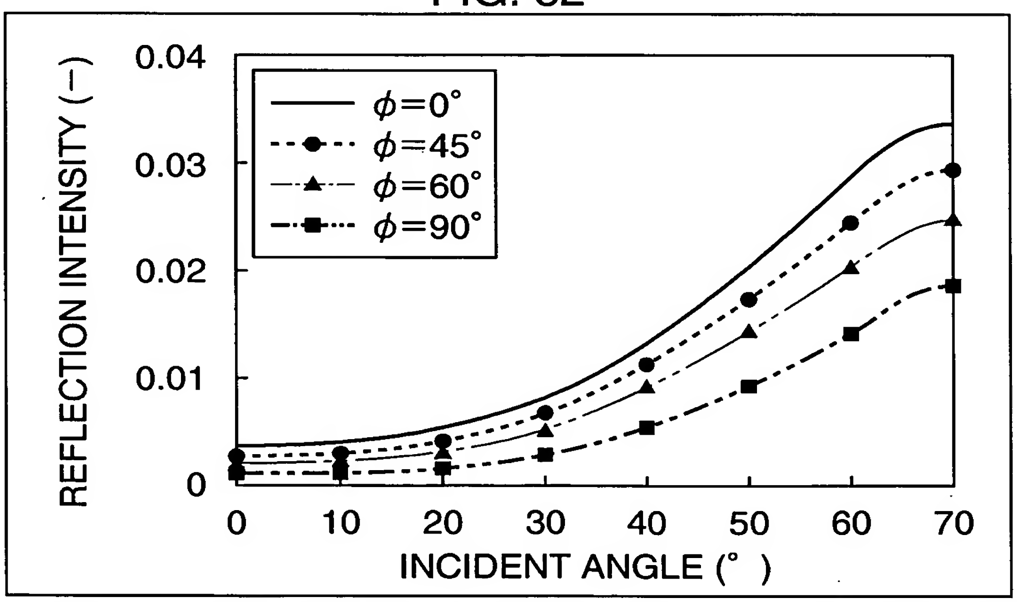
AZIMUTH ANGLE CHARACTERISTICS BY COMPENSATION PLATE (30° INCIDENCE)
UNIAXIAL STRETCHING SHOWS COMPENSATION EFFECTS EQUIVALENT TO THAT BY BIAXIAL STRETCHING IN THE DERECTIONAL AZIMUTHS.
THE REFLECTION INTENSITY IN AZIMUTHS OTHER THAN THE DIRECTIONAL AZIMUTHS DECREASES BY REFLECTING PROJECTIONS AND DEPRESSIONS, SO THAT AZIMUTH DEPENDENCE CAN BE DECREASED.

FIG. 31



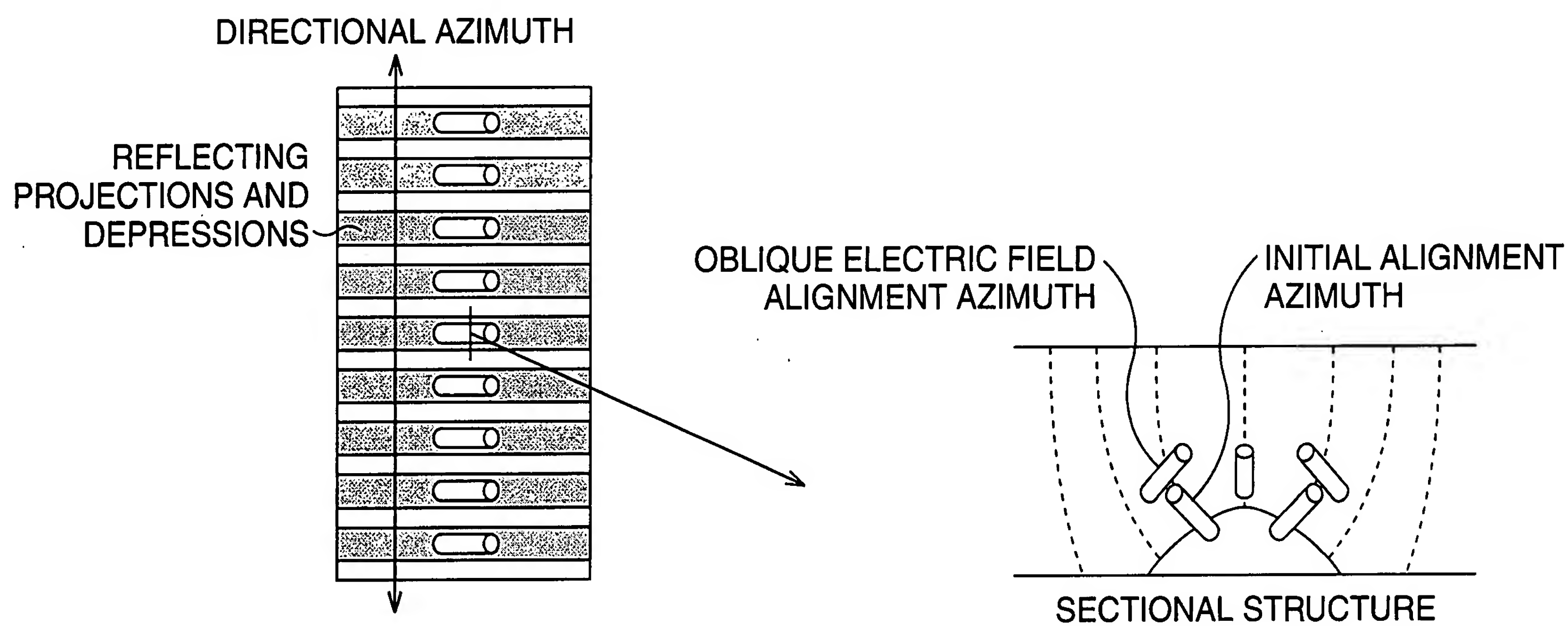
INCIDENT ANGLE CHARACTERISTICS BY COMPENSATION PLATE (270° AZIMUTH)
WHEN THE ANGLE FORMED BETWEEN THE SLOW AXIS OF THE UNIAXIALLY STRETCHED FILM AND THE DIRECTIONAL AZIMUTH IS INCREASED, LIGHT LEAKS MORE IN THE APPLICABLE AZIMUTH, BUT WHERE THE ANGLE IS 30° OR LESS, THE CONTRAST RATIO CAN BE IMPROVED AS COMPARED TO THE CASE WITHOUT COMPENSATION.

FIG. 32



INCIDENT ANGLE CHARACTERISTICS BY ALIGNMENT AZIMUTH (DIRECTIONAL AZIMUTH)
THE REFLECTION INTENSITY IS MINIMUM AT AN ANGLE FORMED BETWEEN THE ALIGNMENT AZIMUTH OF THE LIQUID CRYSTAL AND THE DIRECTIONAL AZIMUTH OF 90°, BUT WHERE THE ANGLE IS 45° OR GREATER, SUFFICIENT IMPROVED EFFECTS AS COMPARED TO THE CASE OF PARALLEL ALIGNMENT (ϕ =0°) CAN BE EXPECTED.

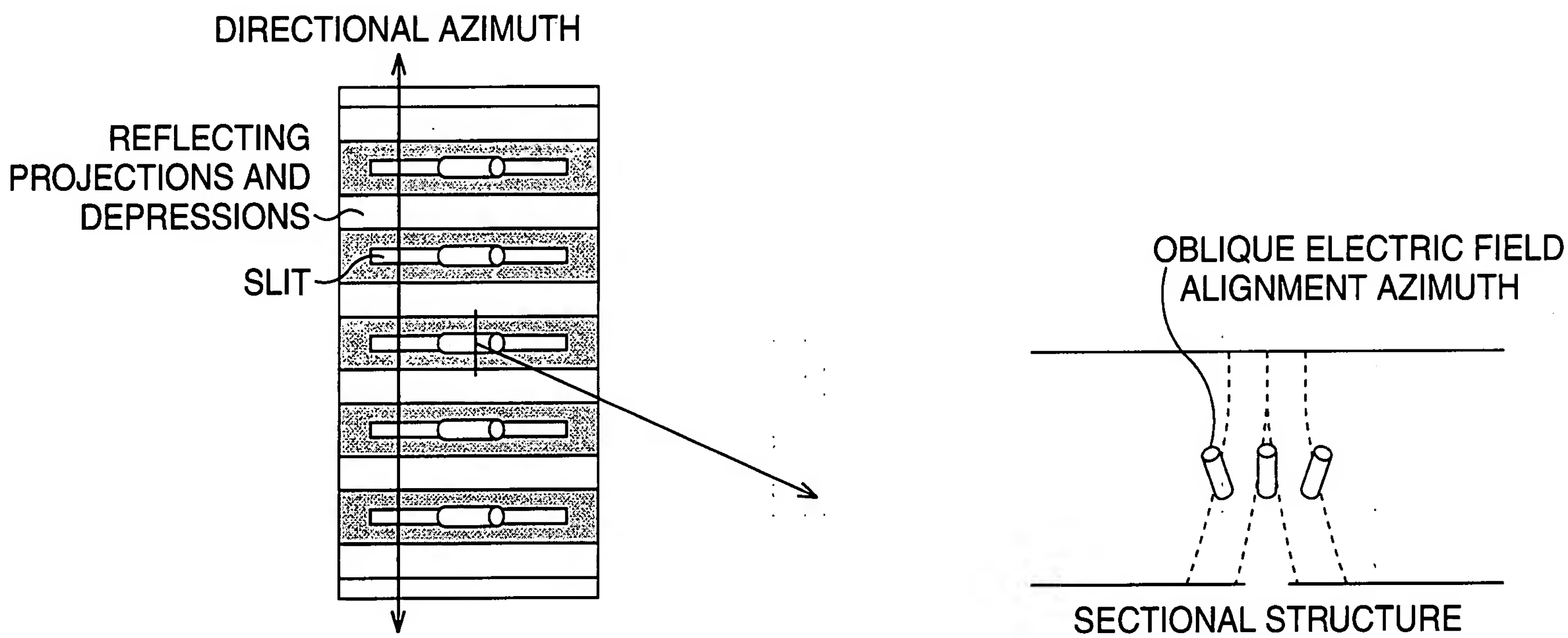
FIG. 33



ALIGNMENT CONTROL USING REFLECTING PROJECTIONS AND DEPRESSIONS

THE AZIMUTH IN WHICH THE LIQUID CRYSTAL INITIALLY TILTS AND THE AZIMUTH IN WHICH THE LIQUID CRYSTAL IS TILT–ALIGNED DUE TO AN OBLIQUE ELECTRIC FIELD ARE OPPOSITE, SO THAT THE LIQUID CRYSTAL IS ALIGNED IN AN AZIMUTH DIFFERENT BY ABOUT 90° FROM THE DIRECTIONAL AZIMUTH.

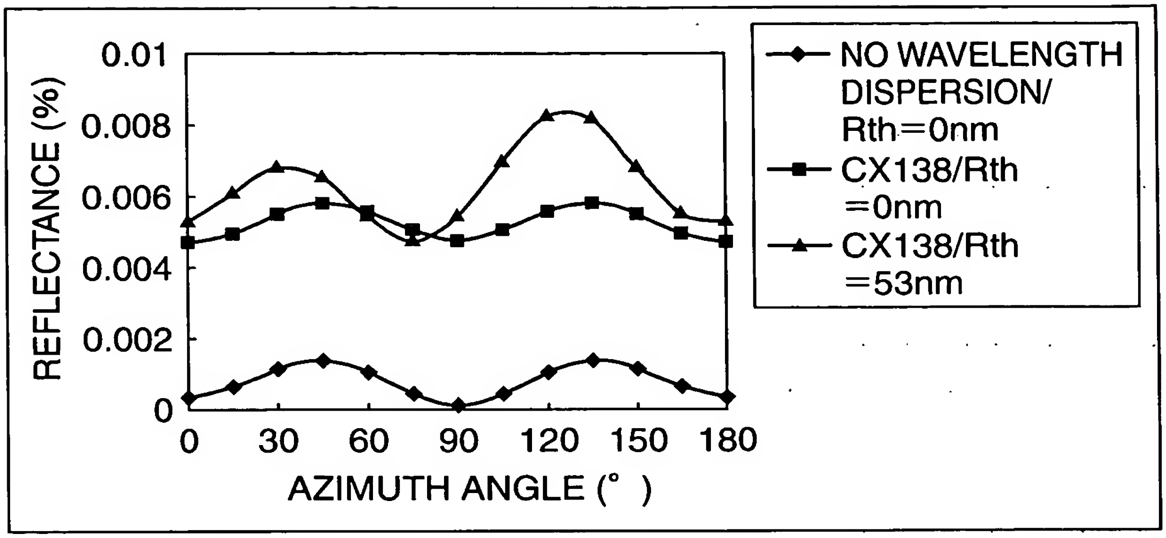
FIG. 34



ALIGNMENT CONTROL USING SLITS

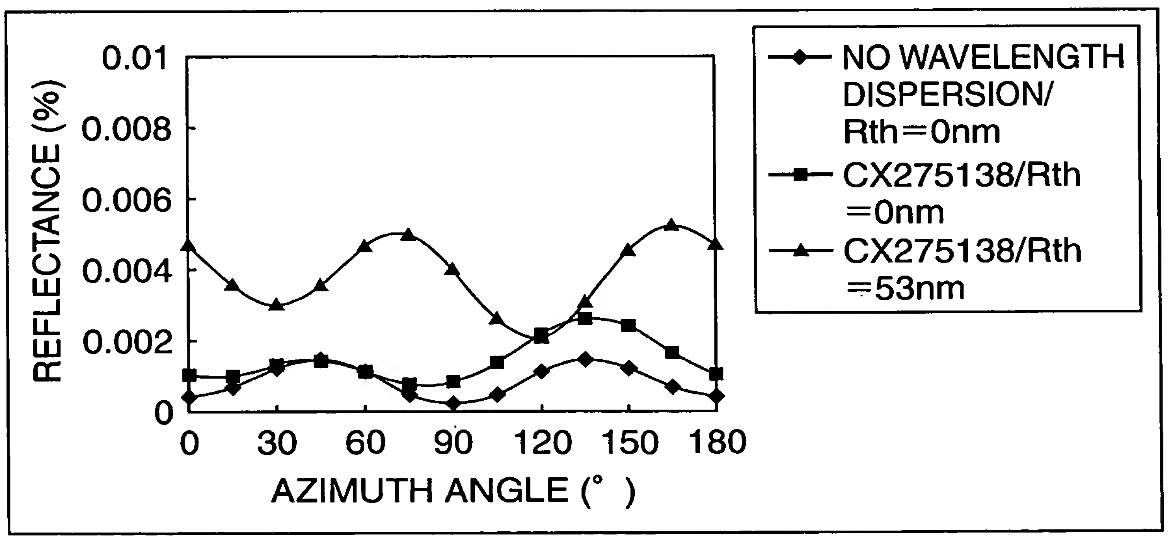
WHEN THE SLIT WIDTH IS DECREASED SO THAT THE TILT ALIGNMENT DUE TO AN OBLIQUE ELECTRIC FIELD IS SMALL, THE LIQUID CRYSTAL IS ALIGNED IN AN AZIMUTH DIFFERENT BY ABOUT 90° FROM THE DIRECTIONAL AZIMUTH.

FIG. 35A



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE+ $\lambda/4$ PLATE

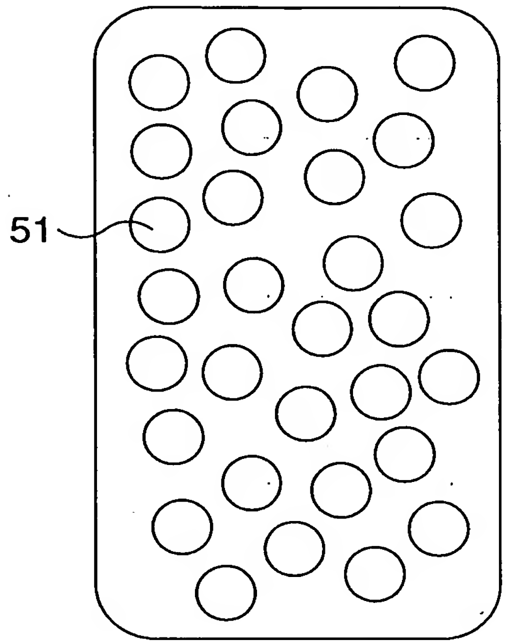
FIG. 35B



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE+BROADBAND $\lambda/4$ PLATE

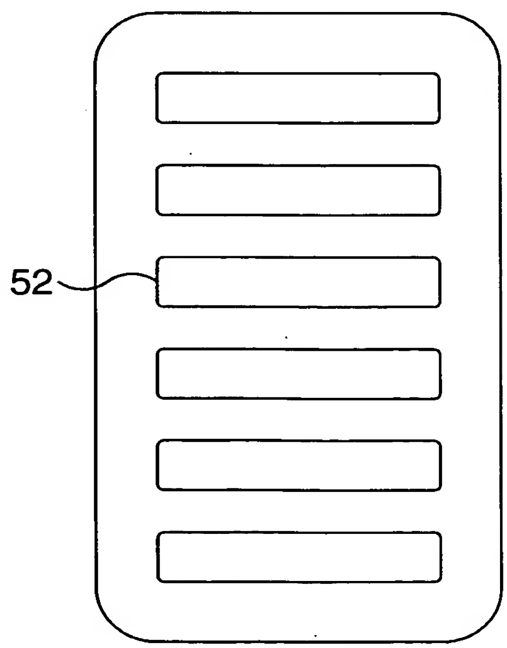
THE REFLECTANCE INCREASES DEPENDING ON THE AXIAL AZIMUTH, WAVELENGTH DISPERSION, AND RETARDATION IN THE THICKNESS DIRECTION (Rth) OF THE RETARDATION PLATE. FURTHER, THE BROADBAND $\lambda/4$ PLATE HAS LESS WAVELENGTH DISPERSION AND ITS AZIUMTH IN WHICH THE REFLECTANCE IS MINIMUM DEVIATES FROM THE AZIMUTH OF THE POLARIZATION AXIS DEPENDING ON Rth. THE DIFFERENCE IN REFLECTANCE BETWEEN THE RETARDATION PLATE HAVING Rth AND THE RETARDATION PLATE HAVING NO Rth IS THE REFLECTANCE INCREASE DUE TO Rth, WHICH IS DIFFERENT DEPENDING ON THE AZIMUTH.

FIG. 36A



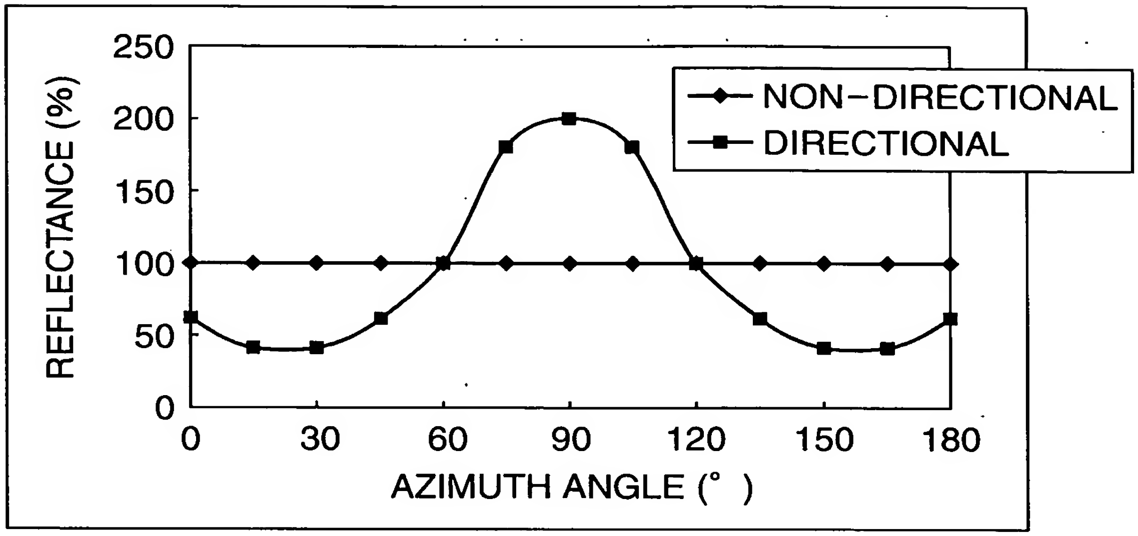
NON-DIRECTIONAL REFLECTOR

FIG. 36B



DIRECTIONAL REFLECTOR

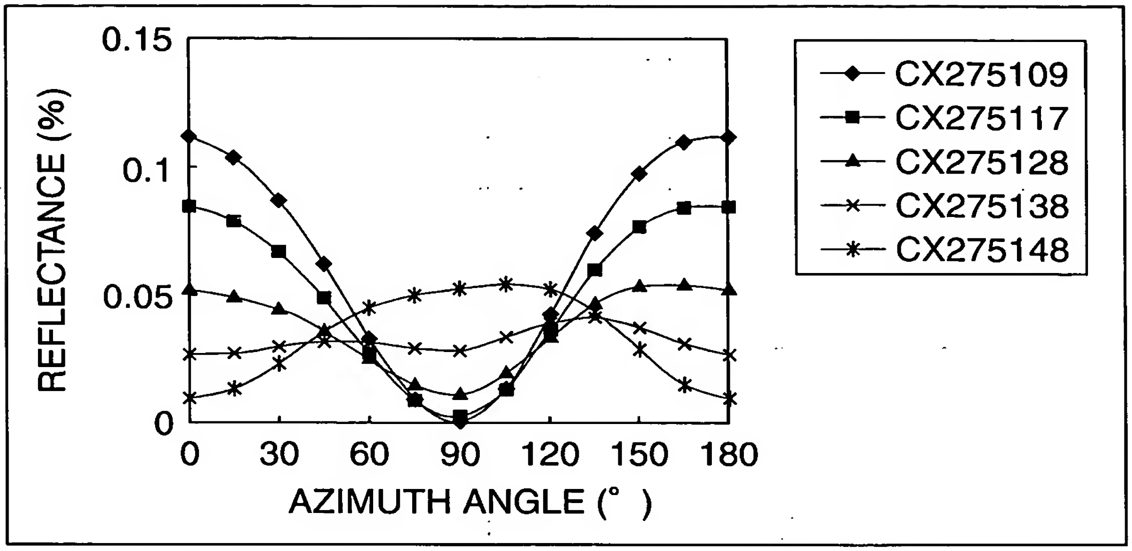
FIG. 37



AZIMUTH DEPENDENCE OF REFLECTANCE OF REFLECTANCE OF REFLECTOR

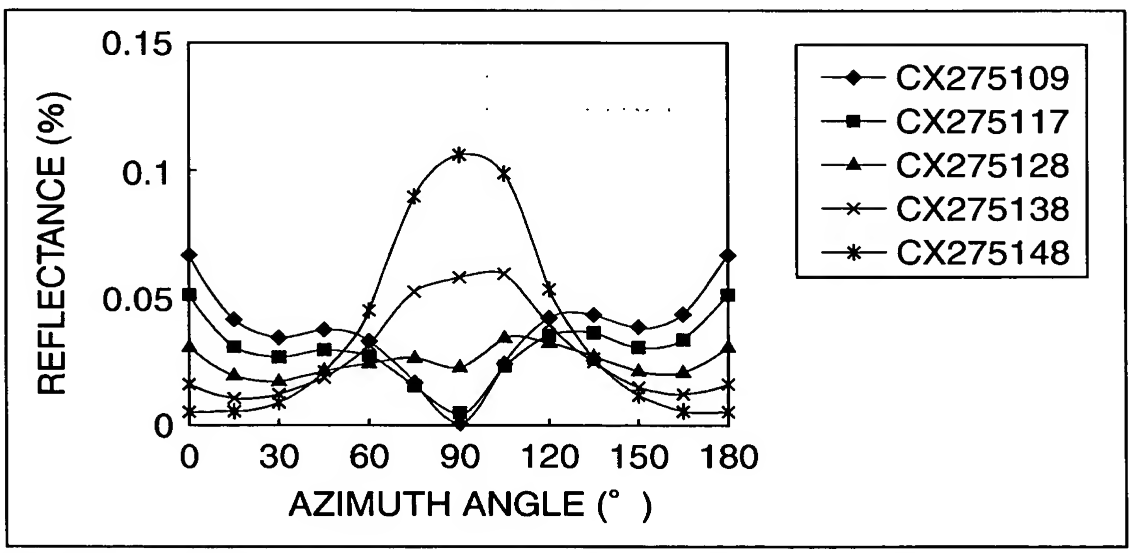
A DIRECTIONAL REFLECTOR SHOWS A REFLECTANCE OF TWICE THE REFLECTANCE OF A NON-DIRECTIONAL REFLECTOR IN THE DIRECTIONAL AZIMUTH (90°) AND REFLECTANCE OF 60 PERCENT OF THE REFLECTANCE IN THE NON-DIRECTIONAL AZIMUTHS.

FIG. 38A



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE + BROADBAND λ/4 PLATE+LIQUID CRYSTAL LAYER (NON-DIRECTIONAL+ λ/4 PLATE VARIABLE)

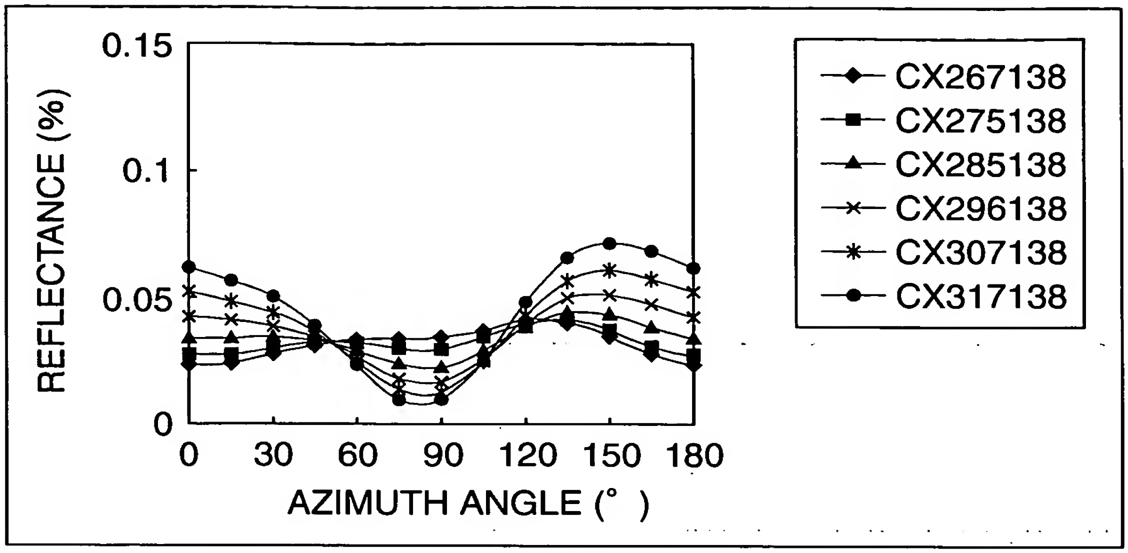
FIG. 38B



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE + BROADBAND λ/4 PLATE+LIQUID CRYSTAL LAYER (DIRECTIONAL+ λ/4 PLATE VARIABLE)

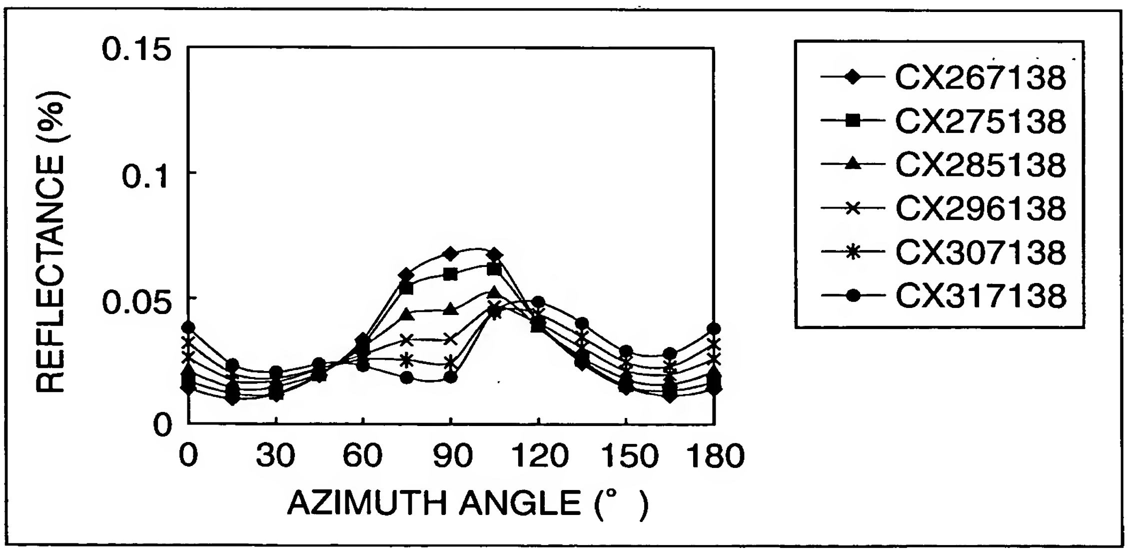
Rth INCREASES IN THE DIRECTIONAL AZIMUTH WHEN THE IN-PLANE RETARDATION OF THE λ/4 PLATE IS DECREASED (PREFERABLY, TO ABOUT 110nm TO 120nm), SO THAT THE RETARDATION OF THE LIQUID CRYSTAL LAYER IS CORRESPONDINGLY COMPENSATED TO DECREASE THE REFLECTANCE. IN CONTRAST TO THE ABOVE, Rth DECREASES IN THE NON-DIRECTIONAL AZIMUTH TO INCREASE THE REFLECTANCE, BUT APPLICATION OF THE DIRECTIONAL REFLECTOR ENABLES THE REFLECTANCE TO BE KEPT UNCHANGED FROM THAT BEFORE THE CHANGE OF THE RETARDATION PLATE.

FIG. 39A



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE + BROADBAND λ/4 PLATE+LIQUID CRYSTAL LAYER (NON-DIRECTIONAL+ λ/2 PLATE VARIABLE)

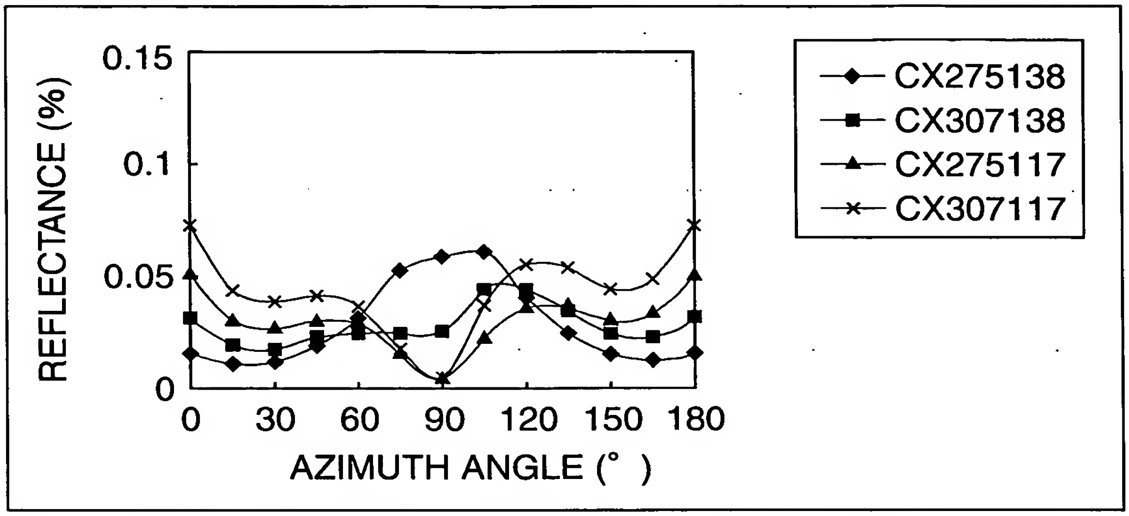
FIG. 39B



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE + BROADBAND λ/4 PLATE+LIQUID CRYSTAL LAYER (DIRECTIONAL+ λ/2 PLATE VARIABLE)

Rth INCREASES IN THE DIRECTIONAL AZIMUTH WHEN THE IN-PLANE RETARDATION OF THE λ/2 PLATE IS INCREASED (PREFERABLY TO ABOUT 300nm TO 320nm), SO THAT THE RETARDATION OF THE LIQUID CRYSTAL LAYER IS CORRESPONDINGLY COMPENSATED TO DECREASE THE REFLECTANCE.

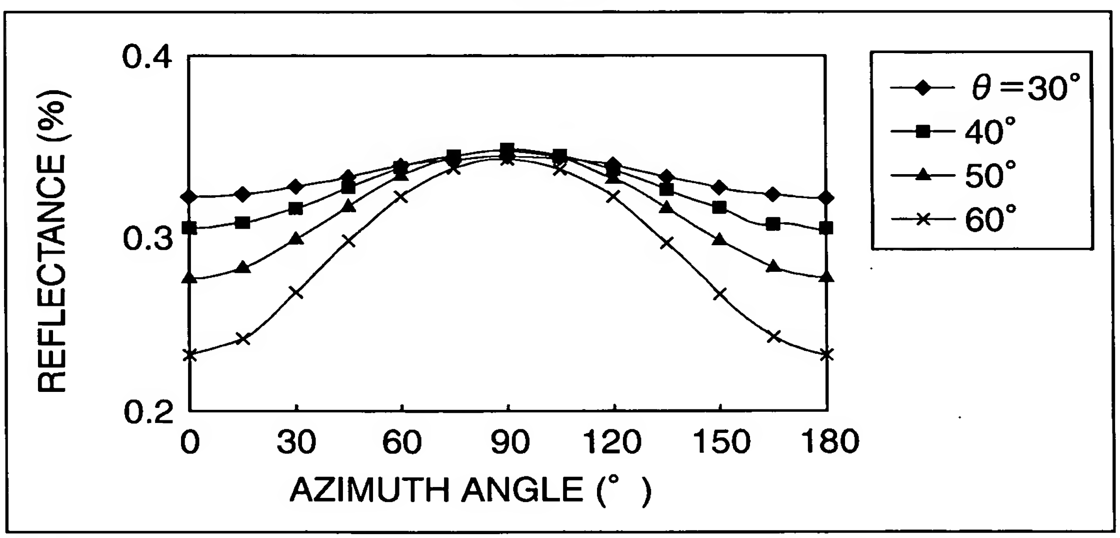
FIG. 40



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE
+ BROADBAND $\lambda/4$ PLATE+LIQUID CRYSTAL LAYER
(DIRECTIONAL, $\lambda/4$ PLATE VARIABLE, $\lambda/2$ PLATE VARIABLE)

THE REFLECTANCE IN THE DIRECTIONAL AZIUTH ALSO DECREASES BY CHANGING THE IN-PLANE RETARDATIONS OF BOTH THE $\lambda/4$ PLATE AND THE $\lambda/2$ PLATE. HOWEVER, THE REFLECTANCE INCREASES IN THE NON-DIRECTIONAL AZIMUTH IS MORE MODERATE WHEN THEY ARE INDIVIDUALLY CHANGES.

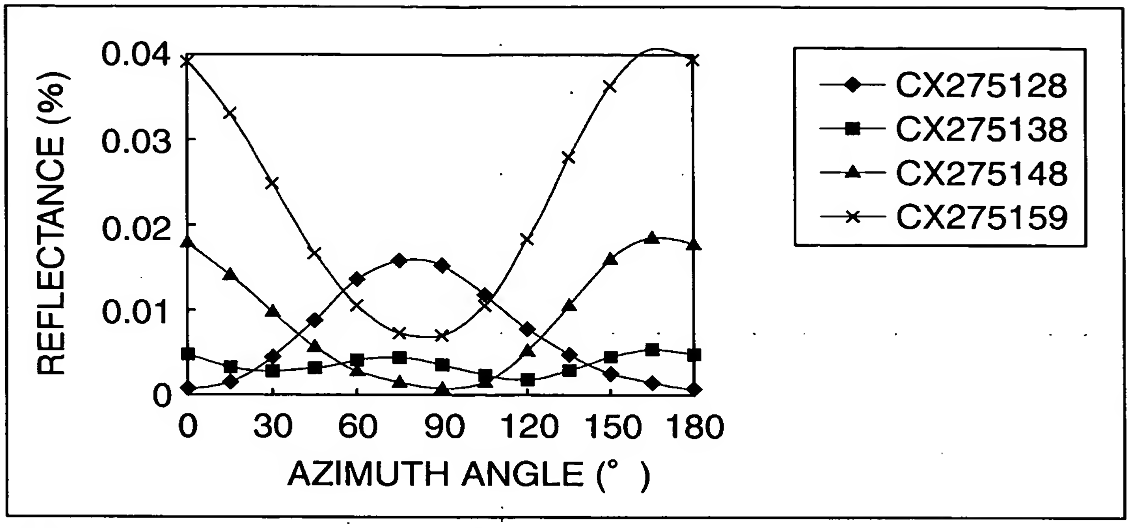
FIG. 41



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE
(θ IS POLAR ANGLE)

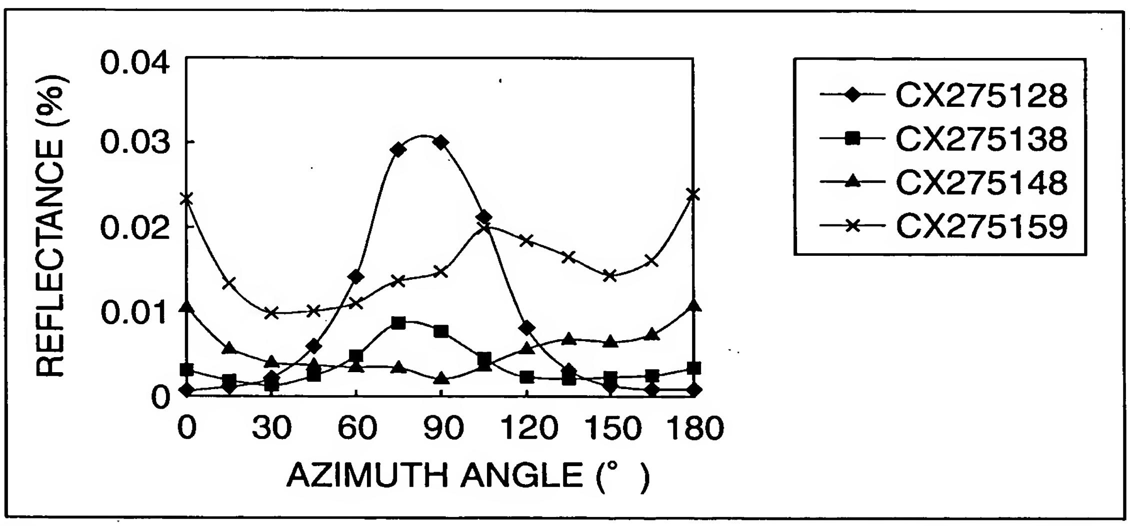
THE REFLECTANCE IS DECREASED IN THE AZIMUTH OF THE ABSORPTION AXIS AS ABSORPTION CHARACTERISTICS OF THE POLARIZING PLATE. WHEN THE AXIAL PLACEMENT IS ROTATES 90°, THE MAGNITUDE RELATION BETWEEN THE RESPECTIVE WAVELENGTH PLATES IS REVERSED, BUT THE WHITE REFLECTANCE IS DECREASED IN THE DIRECTIONAL AZIMUTH.

FIG. 42A



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE + BROADBAND $\lambda/4$ PLATE + OPTICAL COMPENSATION PLATE + LIQUID CRYSTAL LAYER (NON-DIRECTIONAL+ $\lambda/4$ PLATE VARIABLE)

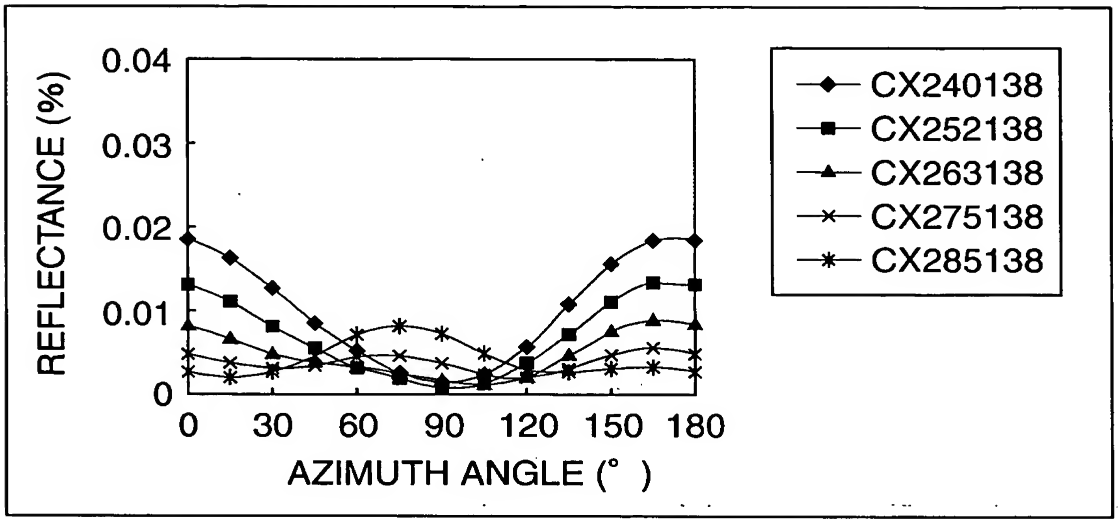
FIG. 42B



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE + BROADBAND $\lambda/4$ PLATE + OPTICAL COMPENSATION PLATE + LIQUID CRYSTAL LAYER (DIRECTIONAL+ $\lambda/4$ PLATE VARIABLE)

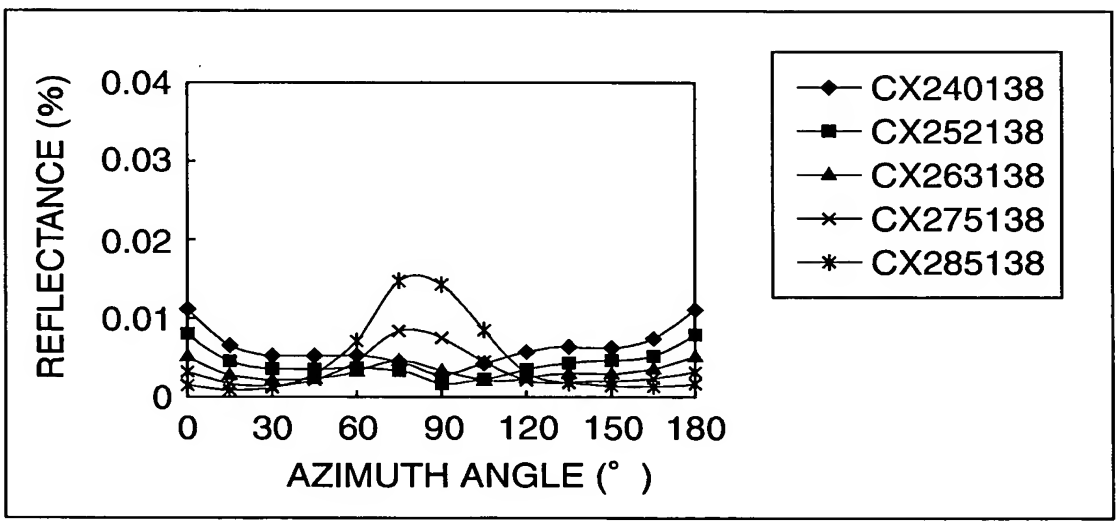
WHERE MOST OF THE RETARDATION OF THE LIQUID CRYSTAL LAYER IS CANCELED BY THE OPTICAL COMPENSATION PLATE, THE REFLECTION CHARACTERISTICS OF THE POLARIZING PLATE +THE BROADBAND $\lambda/4$ PLATE ARE REFLECTED. Rth DECREASES IN THE RETARDATION OF THE $\lambda/4$ PLATE IS INCREASED (PREFERABLY, TO ABOUT 150nm) TO DECREASE THE REFLECTANCE.

FIG. 43A



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE
+ BROADBAND λ/4 PLATE + OPTICAL COMPENSATION PLATE
+ LIQUID CRYSTAL LAYER (NON−DIRECTIONAL+ λ/2 PLATE VARIABLE)

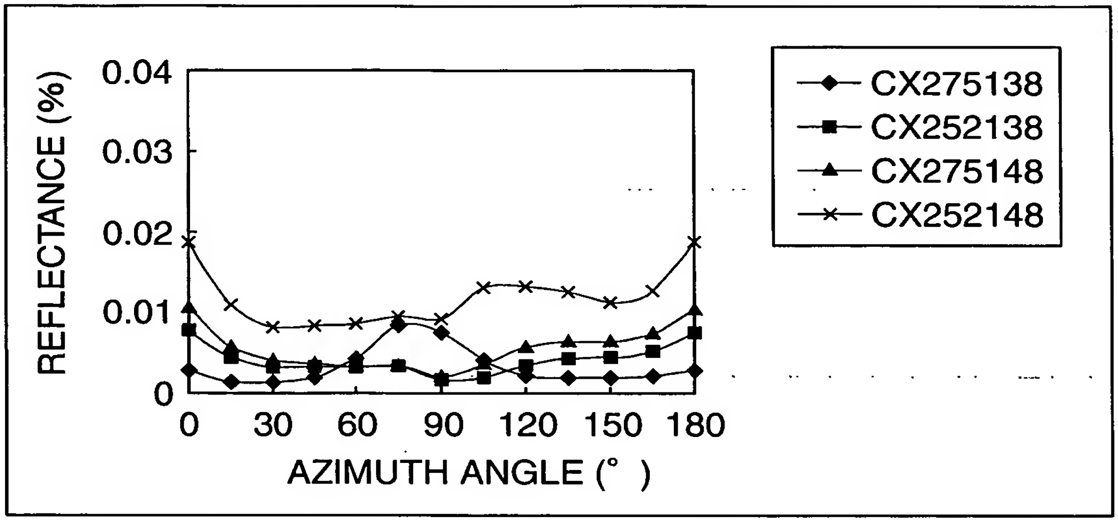
FIG. 43B



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE
+ BROADBAND λ/4 PLATE + OPTICAL COMPENSATION PLATE
+ LIQUID CRYSTAL LAYER (DIRECTIONAL+ λ/2 PLATE VARIABLE)

Rth DECREASES IN THE DIRECTIONAL AZIMUTH WHEN
THE RETARDATION OF THE λ/2 PLATE IS DECREASES
(PREFERABLY TO ABOUT 240 TO 260nm),
SO THAT THE REFLECTANCE IS DECREASED.

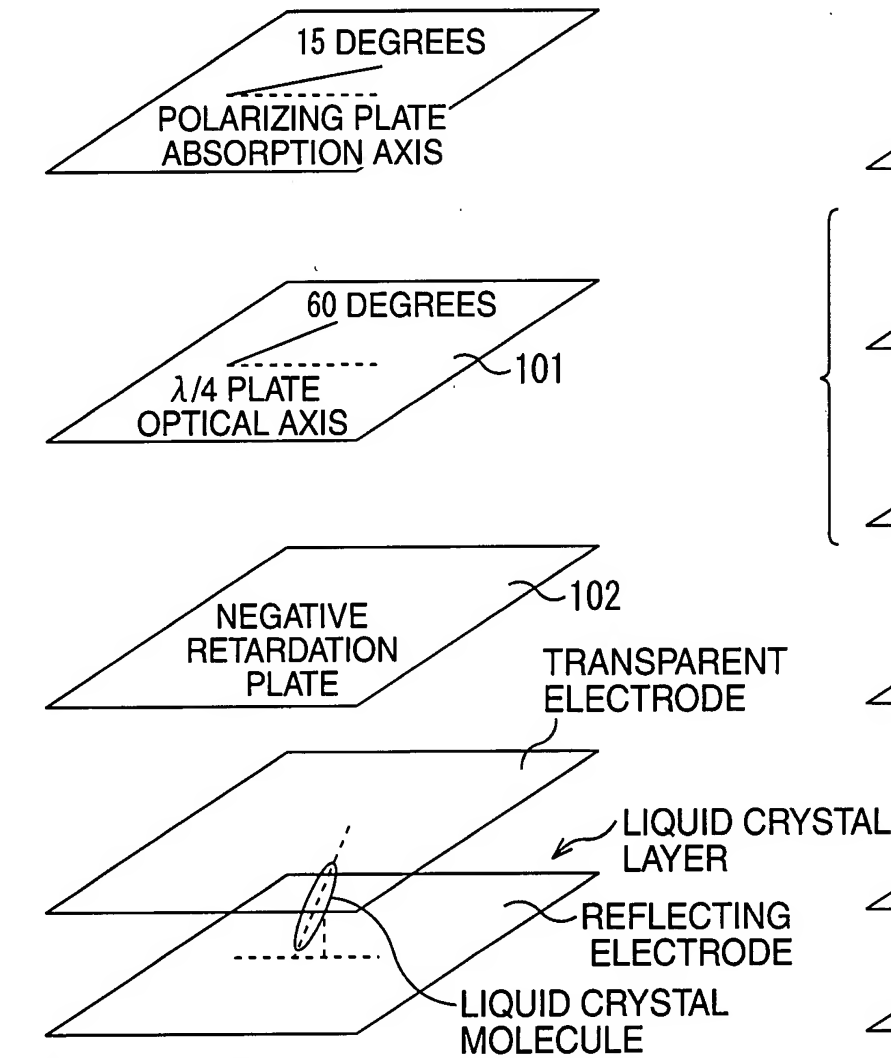
FIG. 44



AZIMUTH DEPENDENCE OF REFLECTANCE OF POLARIZING PLATE
+ BROADBAND λ/4 PLATE + OPTICAL COMPENSATION PLATE
+ LIQUID CRYSTAL LAYER
(DIRECTIONAL, + λ/2 PLATE VARIABLE, λ/4 PLATE VARIABLE)

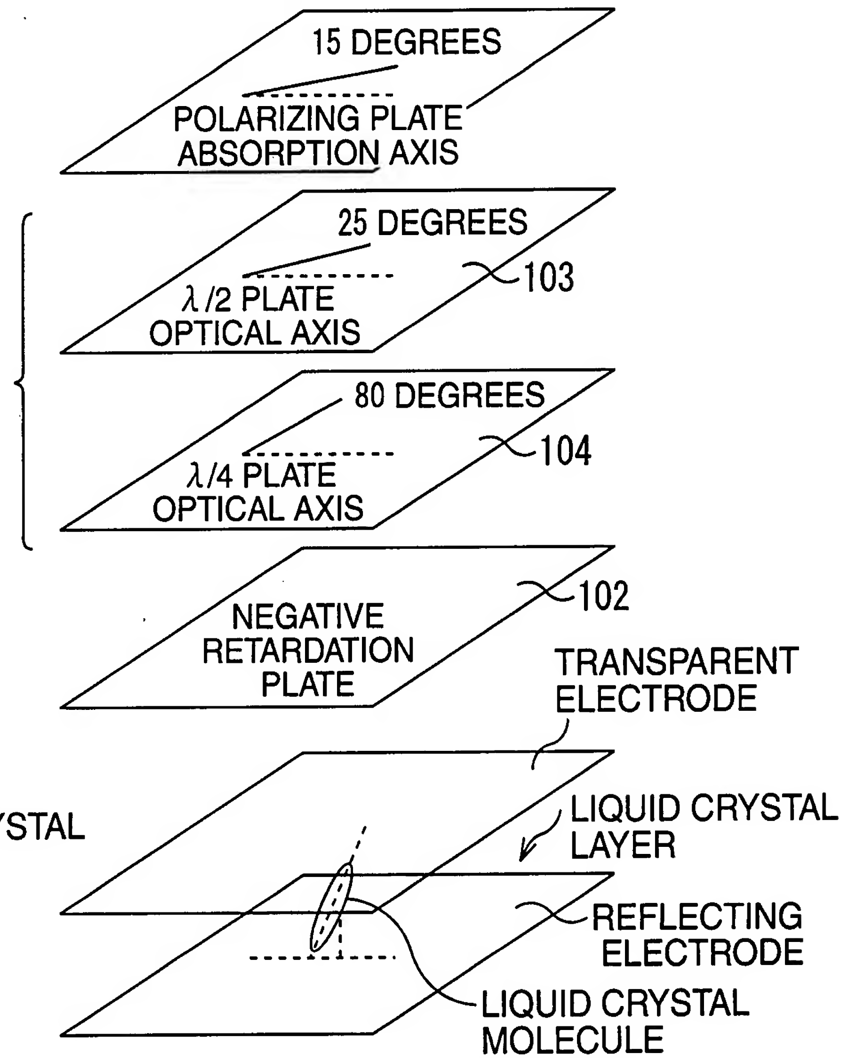
THE REFLECTANCE INCREASES WHEN
THE IN-PLANE RETARDATIONS OF
BOTH THE λ/2 PLATE AND THE λ/4 PLATE ARE CHANGED.

FIG. 45A PRIOR ART



VERTICALLY ALIGNED LIQUID CRYSTAL MOLECULE TILTS IN A 0-DEGREE AZIMUTH WHERE VOLTAGE IS APPLIED

FIG. 45B PRIOR ART



VERTICALLY ALIGNED LIQUID CRYSTAL MOLECULE TILTS IN A 0-DEGREE AZIMUTH WHERE VOLTAGE IS APPLIED